SCIENTIFIC AMERICAN

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LIFTING BRIDGE AT TARANTE.

The bridge of which we give a view crosses the canal that forms a communication between the so-called great and little seas of Tarante, and joins the new town with the old one. This fine work, which was carried out by the Impresa Industriale Italiana di Construzioni Metalliche, directed by Mr. A. Cottrau, was opened for traffic with much ceremony on May 22 last, and is undoubtedly the finest example of its class in Italy. The original scheme is due to Vice-Admiral Acton, who, with the intention of putting it into execution during his tenure of office as Minister of Marine, put out the work to competition among the various Italian constructors. A large number of firms responded to this proposal, and the project that was accepted was the one submitted by the Impresa Cottrau of Naples, on account partly of the very great economy of the design, and partly because of the elegance it displayed, and the simplicity of the hydraulic mechanism employed for opening and closing the bridge.

The following are some of the principal data of the work:

Distance between the axes of rotation	219 ft. 9·8 in.
Clear distance between abutments	188 " 3·9 "
Width between handrails	22 "
Rise in center	12 " 1·6 "
Clear headway	41 "
Total length of ironwork	292 "
Weight of ironwork	526 tons.
" counterbalance	532 "

The bridge consists of two half-arcs meeting accurately in the center when closed. Each leaf is subjected to two movements, a rising and a rotating motion, effected by mechanism that is actuated by two turbines of 14 horse power, working at a speed of 240 revolutions per minute, or by hand power, where 36 men are required at each half of the bridge to work the capstans provided for the purpose. The time required for opening or closing the bridge by hand is 17 minutes. With the turbines the complete operation is effected in 5 minutes. The two turbines are driven from a large reservoir holding about 20,000 cubic feet of water, and placed at a height of 62 feet above the mean sea level. The rotating movement which has to be given to each arm to allow passage for the large ironclads is obtained from two large wheels mounted on Vignoles rails and placed at the end of the abutment, where they are controlled by a system of gearing worked by the turbines. The rising and falling movements are obtained by four nuts worked from an endless screw and by gearing driven from the turbines. Before the bridge was opened for traffic it was tested with a uniformly distributed load of 280 tons, which was kept on the platform for twenty-four hours. The maximum deflection that took place under this load was 3·35 in., or exactly half the amount allowed in the conditions of the government scheme. On the load being removed, this deflection wholly disappeared.—*Engineering.*

Artesian Wells in Dakota.

A correspondent who is traveling in Dakota writes as follows from the town of Artesian, Sanborn County:

This town, as its name indicates, is the center of an artesian well district that extends about ten miles in every direction. It seems to be a sort of a natural artesian well section, where by drilling 60 to 139 feet in depth they get a moderate flow of water, with pressure sufficient to carry it up in a 3 inch pipe about 15 to 20 feet above the surface of the ground, costing the farmer (and nearly every farmer has one) about $100 for well, pipe, etc., included--an invaluable adjunct to a farm. The water just here, in the village, is very hard and impregnated with iron, but some of the wells yield fairly soft water. The water varies from extremely hard to nearly soft.

The district was first discovered when the Chicago, Milwaukee & St. Paul Railway, at this point, three years ago, for railway purposes, commenced a well which was dug 10 feet diameter, 50 feet deep, without success. A drill was then introduced 56 feet further, 6 inches diameter, when, suddenly, it sank 4 feet into a chamber, and the well immediately flowed 10,000 gallons per hour.

The surplus water of all the various wells gives no trouble, finding its way to slough and lake bottoms. Some farmers, as well as the railway company, now run rams with the surplus water that pumps it up 30 feet high, as the pressure is not as great as when first discovered.

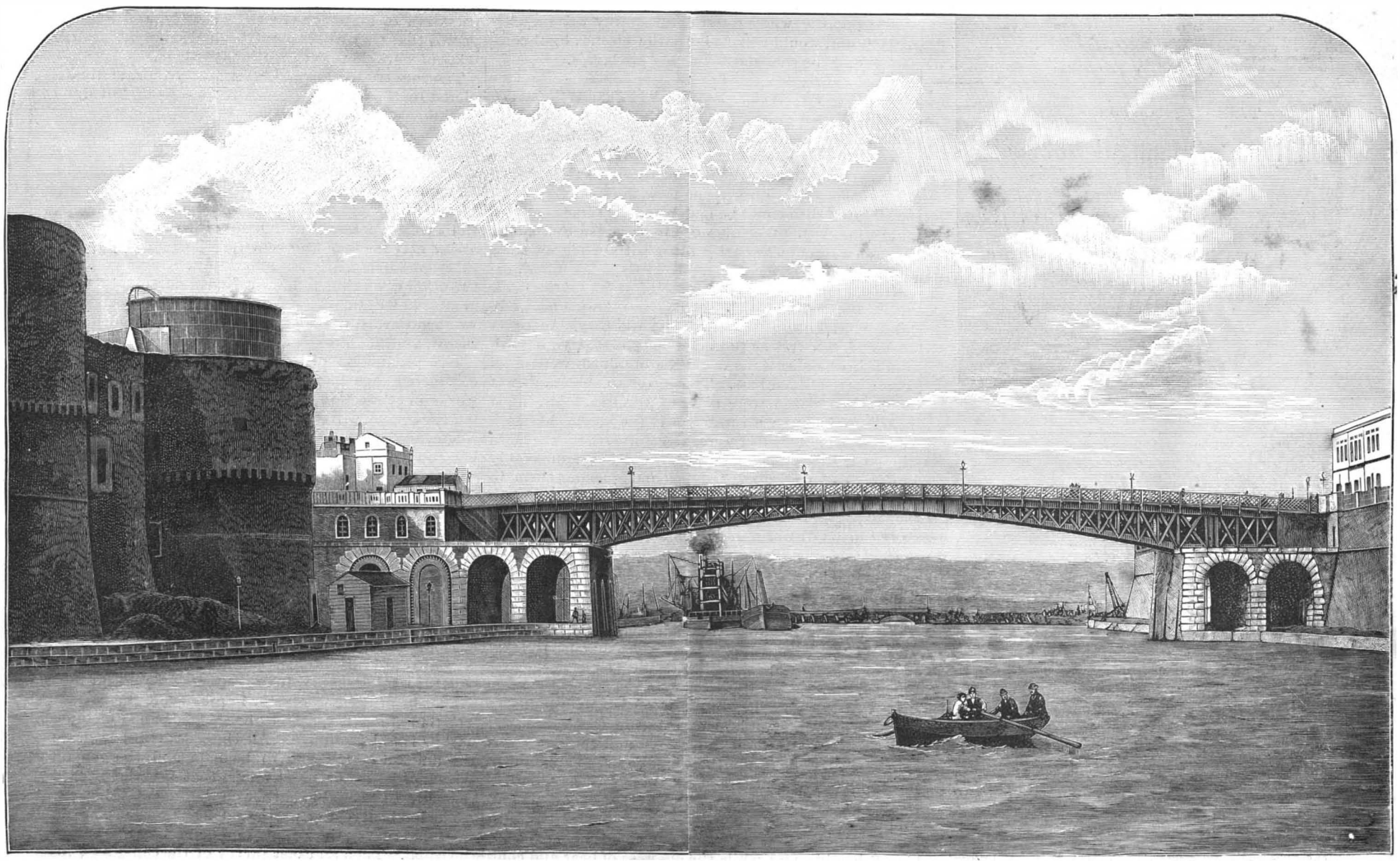
I am told that at Aberdeen, 100 miles north of this place, where they have an artesian well 1,100 feet deep, it throws up live fish.

It would seem feasible to arrange a system of sprinklers over a section of land, whereby water might be turned on to the wheat or other crops in case of drought.

Good beef steers sell here now for 2 cents per pound live weight, and farmers kick at the low price. Hogs are worth 4 cents, which is thought to be an excellent price. Corn sells at 20 cents per bushel, or say $5.75 per ton, allowing 70 pounds to the bushel—very cheap. Some talk of burning it for fuel, as it is considered fully as cheap as Pennsylvania hard coal, present price of which is $11.50 per ton. Corn on the ear is said to make first class fuel by those who have used it.

The Return of the Waters.

A recent phenomenon in Central Illinois puzzles scientific and other people. After weeks of drought, the streams and wells becoming exhausted, abundant water suddenly appeared, without rain or other visible source of supply. Water flowed freely in the streams, and even the shallowest wells were replenished. Where this water came from and the cause of its sudden appearance are mysteries which no man can find out. Some religious people believe it was an answer to prayer. It is probable that the effect was produced by a subterranean disturbance similar to that of an earthquake shock.—*Chicago Journal.*



NEW LIFTING BRIDGE AT TARANTE, ITALY.

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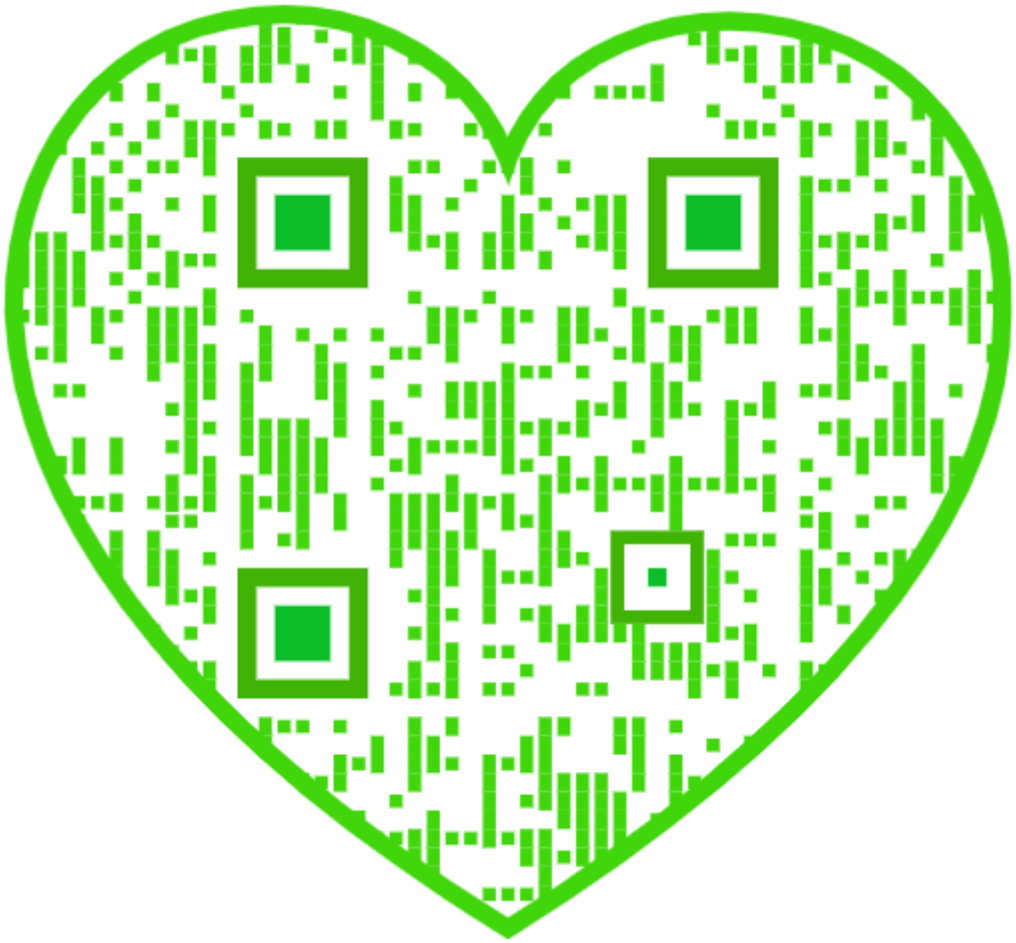

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THE ILLUMINATING POWER OF ARC LAMPS.

Within the last year some discussion has arisen concerning the true candle power of arc lamps. In the majority of contracts for street lighting entered into with electric light companies, the contract specifies 2,000 candle power lamps. For many years it has been understood that the lamps seen lighted upon the streets purported to be of this power. But it has been equally obvious to those who were at all experienced in photometry that they did not give anything like such a light. Their actual candle power is slightly in excess of one-third the nominal amount. The stated candle power has no more direct reference to their actual than the nominal horse power of a boiler has to its real capacity.

The subject was recently treated in a report by a well known scientist, who took the ground that, in stating electric illuminating power, two thousand nominal was to be taken as a synonym for about eight hundred actual candle power. Although this seems a rather broad generalization, it expresses the true state of affairs pretty accurately. The arc lamps are always greatly overrated.

As for the cause of the discrepancy, some engineers were uncharitable enough to ascribe it to a new system of stating the observed results. If a lamp were photometered in four directions at once, as on the cross photometer, and the results added together, then it was claimed the fictitious result given to the public would result. This would indicate a statement of a candle power four times greater than the real.

One of the leading authorities on the subject of electric lighting has recently assigned a cause for the anomaly. At the present time the ends of the carbons in arc lamps are maintained opposite to each other, and the two carbons are kept accurately in line. Hence an equal or nearly equal light is given in all directions. The first use of the arc lamp was for purposes of projection. For this purpose the carbons were kept slightly out of line with each other, so as to concentrate the light in a determined direction. The crater formed in the lower carbon faced in one direction, and in that line most of the light was emitted. At the back of the lamp the light was far less. If the same carbons were placed in alignment, a more even distribution of light would result, but it would be far less, in the ratio of 2·83 to 1, than it was in the former arrangement in the most favorable point. Thus a lamp which, with the old arrangement of carbons, would project a light of 2,000 candles in one direction, with the same carbons aligned would only give $\frac{2000}{2{\cdot}83}$, or a little over seven hundred candles. The old type of lamps were photometered in the most favorable direction.

It would seem advisable that the nominal method should be changed, and that new contracts should specify lamps of so many actual candle power. This would put the whole question of supply upon a basis of fact, and would benefit both the electric light companies and the consumers who use arc lamps.

A NEWLY PATENTED MODE OF PRESERVING LIVE FISH.

An interesting and curious invention has been lately patented, which bids fair to be useful and important in the transportation of live fish. It was discovered by Mr. Walter G. Murphy, of New York City, the patentee, that fish could be kept alive for some considerable time without change of air or water by placing them in a receptacle partly filled with water, and hermetically sealing the same. To test the invention, experiments were carried on, some of them by the favor of Professor Blackford, of the New York Fish Commission, at Fulton Market, New York City. In order to make the test as thorough as possible, young fish and fish as delicate as could be obtained were used. These were striped bass. The latter to the number of about two dozen were placed in a glass jar, filled nearly to the top with water, and the jar was hermetically sealed. The fish were kept for several weeks in the jar without opening it, and did not appreciably suffer. Upon opening the jar and placing them in fresh water, they appeared as lively and well as before being placed in the jar. Another similar experiment being made, it was found after several weeks' confinement, the time being extended beyond that of the former experiment, that the deep black lines in the bass began to fade and disappear and a white fungus made its appearance on the fish, which was speedily followed by their death. Experiment with the jar *wholly* filled with water showed that the fish quickly died. Another experiment with the fish as in the first mentioned case was made, and a second jar the same as the first, with a like number of fish, and similarly filled with water, was placed beside the sealed jar. The second jar was left uncovered and the water was unchanged. The fish in the closed jar were apparently as well as ever at the end of three weeks. The fish in the open jar all died within forty-eight hours. While changes of temperature were known to be a serious question as affecting the conditions of keeping fish alive, and while the changes of heat and cold, to which the jar and contents were unavoidably subjected, could not be well regulated, yet the fish in the closed jar were not affected thereby. Experiments were also tried in which the air in the jar containing the water and fish was compressed, and it was found that the fish were benefited thereby. It would appear from the above mentioned experiments that grown fish and hardy fish could be transported from one distant locality to another with little trouble and expense, and that in the case of deep-sea fish compression of the air would aid in effecting the result. The advantage to sportsmen in carrying live bait would seem to be great, and the value to the U. S. Fish Commission to be inestimable almost, in view of the great expense now incurred in building special cars and apparatus to transport and keep fish alive. The scientific reason for the result of this invention has not been explained. The late Professor Baird, of the United States Fish Commission, when the invention was brought to his attention, suggested that by reason of hermetically sealing the jar, water did not undergo the rapid change that took place when the jar was left open, and which bred a parasite which destroyed the fish. Whatever be the reason, it would seem that the invention was one of great benefit and value, and that while the fish so treated will eventually die if not taken out after a certain time, yet practically, for the purpose of transporting fish alive, the result attained is a complete success.

SURVEY OF THE ROUTE FOR THE NICARAGUA CANAL.

On Wednesday, November 30, the steamer Hondo sailed for Greytown, Nicaragua, carrying with her a party of engineers who are to make the surveys for the Nicaragua canal. They were accompanied down the bay by an excursion steamer, carrying many well-known representatives of the two countries.

In 1884 an attempt was made to negotiate a treaty with the United States government for the construction of the canal, but it fell through. The Nicaraguan government then opened negotiations with Mr. A. G. Menocal as representative of the Nicaragua Canal Association of New York. The result of the negotiations was the formation of a contract between the two parties. Nicaragua confers upon the canal association the exclusive right of way and other privileges. In addition to these concessions, the present contract required on the part of the American company the fulfillment of certain pecuniary obligations within sixty days of its signing. This placed the contract at once on a business basis. The obligations were duly met, and the present company of engineers are to execute the first field work and perform the final survey.

The chief engineer of the company is Mr. A. G. Menocal, Civil Engineer, U. S. A. The party that sailed on the Hondo is under command of Mr. R. E. Peary, C. E., the chief assistant. It includes eighteen engineers and an equal number of assistants and a surgeon. The party are to locate the route definitely, and it is expected that they will execute the final surveys. A large body of workmen are to accompany them.

The country has already been pretty thoroughly explored by the officers of the U. S. navy. Based upon the knowledge already possessed, a long letter of instructions was prepared for the guidance of the survey. Two general plans are to be examined. Both are identical for the greater part of the route, utilizing the Lake of Nicaragua and San Juan River. The divergence occurs between the lake and the northern shore. Both routes follow the San Juan River until within about fifty miles of the coast. From this point one route goes in a nearly straight line to Greytown, while the other diverging follows a line about eleven miles greater in length. The short or so-called upper route will be awarded the preference in the surveys, although the capabilities of both will be determined.

The production of a good harbor at Greytown is considered one of the most important engineering works in connection with the enterprise. On reaching Nicaragua, a hydrographic survey is to be at once commenced, to determine the capabilities of the harbor and the best way of dealing with the sand bars. Owing to the tides, to wave action, and possibly to river sediment, the harbor has of late years become much deteriorated. The principal cause is considered to be the transportation of sand from east to west by the waves striking the coast obliquely. To determine the extent of the deposits made in a given time, two hydrographic surveys are to be executed, one at the beginning and the other at the end of operations. The changes in the bottom in the interval will disclose the amount of drift and deposit in a given time. A southward littoral current has been reported, and this is to be carefully investigated, to ascertain if it cannot be utilized as a factor in preserving the harbor. The San Juan River is to be gauged, and the inner harbor is to be sounded. All these data will indicate the amount of dredging to be done and the general system of jetties or breakwaters that may be needed to secure an available harbor on the Atlantic side.

The land surveying parties, in five divisions, are to carefully survey the ground and determine the axis of the canal. Then an exact survey of the canal line, including cross sections, level points, location of slope

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lines, etc., is to be completed. This is designed, as far as possible, to give a correct idea of the amount of excavation required.

The examination and survey of the port of Brito, on the Pacific coast, is also provided for, and is to be performed toward the end of the season's work.

A dispute as to the boundary line between Costa Rica and Nicaragua is now in the hands of President Cleveland for arbitration. This affects the canal quite seriously, as Costa Rica claims some rights in territory through which the canal, near its northern end, would normally pass. Recognizing the importance of having its whole length included within the one republic, a third deviation, bringing it all within the undisputed territory of Nicaragua, is to be one object of survey. This third route very probably will not be used, but it is to be located so as to provide for any contingency that may arise, owing to the international dispute.

The total length by the shorter line is calculated at 169·8 miles. Lake Nicaragua is the summit level, and is 110 feet above tide water. On each side of the lake a number of locks will be required to overcome this difference. The canal is to vary in bottom width from 80 to 120 feet, and in upper width from 80 to 288 feet. Its depth is to vary from 28 to 30 feet. Of the route, 120 miles are included in the river San Juan and in the lake, and will be available for rapid navigation. The total cost is estimated at $64,036,197. For tonnage dues, at $2.50 per ton (the Suez Canal rate), a total of over sixteen millions of dollars for the year 1892 is assumed as possible.

The latter date marks the possible era of completion. At present Mr. Menocal is still in this country, but during the winter he will go to the field of operations.

THE CELESTIAL WORLD.

SATURN AND THE CLUSTER PRÆSEPE.

The constellation Cancer, through which Saturn is now traveling, contains a cluster of stars called Præsepe. It is visible to the naked eye on a clear, moonless night as a nebulous mass of light resembling the nucleus of a comet, for which it has sometimes been mistaken. A small telescope will resolve it into stars, the largest of which are of the seventh or eighth magnitude. This cluster lies about two degrees west of Delta and Gamma Cancri, two conspicuous stars of the fourth magnitude.

During the month of November, Saturn passed less than a degree south of Præsepe, and, on November 17, was very near Delta Cancri, moving at that time eastward or in a direct course. At that point in his apparent path, he remained stationary for a few days, and then, making a curve, began to move backward or retrograde, his returning path lying north of his advancing one. This retrograde movement will bring him within the precincts of the cluster, and during the first half of December he will be found traversing the southern border of Præsepe. This aspect of Saturn will repay telescopic observation. A good instrument will reveal the wonder of our planetary system surrounded by his belts and moons, and will also separate the cluster into tiny stars through which the planet of peerless beauty slowly makes his way.

Saturn rises soon after 7 o'clock, about the middle of the month, and may be readily recognized, as there are no bright stars in his vicinity, and also from his position southeast of the twin stars, Castor and Pollux.

THE APPROACH OF VENUS AND JUPITER.

The most interesting planetary observation of the month is the approach of Venus and Jupiter on the celestial pathway. The morning sky will be made brilliant with their presence among the stars that twinkle in the east, and observers who command a view of the southeastern sky, and are willing to waken early from their slumbers, will be rewarded for their pains when they behold the beauty of the spectacle. The reason for the approach of the two planets may be easily explained. Venus, on the 2d, reached her greatest western elongation, or greatest distance west of the sun. She then arrived at her western limit, and began to retrace her steps toward the sun, moving eastward. Jupiter is receding from the sun, and traveling westward. If Venus is moving east and Jupiter is moving west, on the same side of the sun, the approach between them is inevitable. The student of the stars will see this for himself, and will not fail to pay a tribute of admiration to the exceeding beauty of the starlit December sky, among whose glittering hosts the two peerless planets of the sun's family of worlds wend their shining way. On the 1st, Jupiter rises about two hours and a half after Venus. On the 31st, he rises only thirteen minutes after his fair rival.

THE TOTAL SOLAR ECLIPSE OF AUGUST 19.

There were a few bright spots in the clouds of disappointment that overshadowed the observers of the last total solar eclipse.

In Irkoutsk, Eastern Siberia, the sky was cloudless and the atmosphere serene through the whole day. An observer succeeded in getting three good photographs of the sun during the eclipse, one taken toward its commencement at 11 h. 10 m. A. M.; the second, during totality, at 0 h. 25 m. P. M.; and the third, toward the end, at 0 h. 55 m. P. M.

THE INFERIOR CONJUNCTION OF VENUS.

The inferior conjunction of Venus occurred on September 21, at 11 o'clock in the morning. She then passed between the sun and the earth. If under these conditions she is at her node, she passes directly between the sun and the earth, and makes a transit over the sun's face, as in 1882. If she is in her ascending node, she passes above the sun, and if she is in her descending node, she passes below him. At the last inferior conjunction she was 8° below the sun, being then in her descending node. Although invisible to the naked eye at that time, her entire course was followed by several observers with the aid of a small telescope. In Paris, M. Flammarion used a small telescope, following closely the course of the crescent as it grew more and more slender until on the 21st the middle of the crescent measured 1″. The points were very fine and did not extend beyond the semicircle. The crescent was regular in its whole extent. At Marseilles, M. Bruguiere followed the crescent of Venus without interruption from the 17th to the 23d. At Rouen M. Gully, and at Soissons M. Guiot, followed the planet during the same period.

VENUS VISIBLE IN DAYLIGHT.

This peerless planet was seen as evening star in daylight for an unusual length of time during the past year. M. Bruguiere at Marseilles observed her during the day, with the naked eye, from March 26 to September 16. M. Guiot, at Soissons, observed her in full daylight and with the naked eye from April 2 to August 18. She has been equally observable as morning star, under the same conditions, being visible in full daylight to the unaided eye through October and November.

Cholera and Cold Weather.

In a letter to the editor of the *New York Medical Record*, Dr. Reginald H. Sayre, of New York, quotes a number of instances to show that cholera is one of those scourges whose march is not stopped by heat or cold, high or low altitude, dryness or dampness, or any other condition of the weather. He says:

"In 1830 the cholera appeared in Moscow in the month of October, and continued its ravages until the end of December, in spite of the severities of a Russian winter, and caused the death of 8,130 persons out of a population of 250,000, or about 1 in 30. From Moscow it went north to Yarasy, thence to Rybinsk, sixty leagues north of Moscow, where it appeared on March 19, 1831, in spite of the ice and snow which covered the ground.

"In October, 1831, the cholera appeared in Great Britain, and continued there until March, 1832, doing most of its destruction in December. About one-third of the people affected died.

"On March 27, 1832, the disease appeared in Paris, and the mortality was so frightful that 861 people died in ten days.

"In 1848 the emigrant ship New York left Havre on the 9th of November, having no sickness on board, and no cholera being then in Havre. During the voyage the weather became bitterly cold. There were some German emigrants on board, from a town where cholera had prevailed, who had a trunk which had belonged to a man who had died of cholera. They opened the trunk, took out the clothing, and wore it. On November 22 a child died of cholera, and seven persons in all succumbed to it before reaching New York harbor. They were strictly quarantined, and the disease limited to those who died on Staten Island in the quarantine.

"About this same time another vessel from Havre, bound for New Orleans, developed the cholera on the twenty-seventh day out, and, owing to imperfect quarantine regulations, the disease spread rapidly through the town soon after the arrival of the vessel, there being then no other cases in the United States except those in the quarantine on Staten Island. From New Orleans the disease traveled to Memphis, appearing there toward the end of December, and at St. Louis in the first week of January, 1849. Toward March several places in the Upper Mississippi valley were affected, and then gradually the disease moved east through Chicago, which it reached in May, to New York, which became infected then, *and not till then*, although the disease had been imported to the city six months previously, but had not been allowed to land; and the city in this way kept free from infection until the cholera effected a flank movement, by the way of New Orleans, and attacked her in the rear, having made its progress in spite of the winter, and having attacked the cities through which it passed in the cold weather.

"These facts in regard to the prevalence of cholera in spite of cold, and the well-known futility of a quarantine on land, make any attempt to lull the medical profession into a false sense of security fraught with great danger to the country, and I have therefore wished to call attention to the fact that cholera is *not* stopped by cold, and that to be quarantined effectively it must be arrested in our ports, which can only be done by having a general quarantine under the direction of the federal government."

DECISIONS RELATING TO PATENTS.

U. S. Circuit Court.—Southern District of New York.

MONTROSS *v.* MABIE.

IMPLIED LICENSE TO USE.

BROWN, *J.:*

The extent of an implied license to make and sell patented articles is to be construed according to the presumed intent of the parties, as inferred from the circumstances.

A firm having been largely engaged during several years in manufacturing and selling stoves upon designs patented by one of the partners, and accounts between them having been repeatedly settled embracing such sales and the profits thereon, as firm business, *held*, without regard to the question whether the patent was equitably the exclusive property of the patentee, (1) that a license by the patentee to the firm to make the stoves and to sell those manufactured was implied; (2) that such license, by necessary implication, was co-extensive with the business of the firm, and continued until the copartnership affairs were wound up by any lawful agencies for that purpose; (3) that, consequently, the copartner of the patentee had the same authority after dissolution as before to sell for the benefit of the firm the stoves manufactured for sale before dissolution; and (4) that a receiver of the partnership effects, appointed by a State court in a suit brought for winding up the affairs of the partnership, had a similar authority to sell the stoves remaining on hand, both as the representative of the parties and as a lawful agency for closing up the partnership business, and was by necessary implication included in the implied license. An application for an injunction to restrain him from selling was therefore refused.

U. S. Circuit Court.—Northern District of Illinois.

TOEPFER *v.* GOETZ *et al.*

MALT KILN PATENT.

BLODGETT, *J.:*

This was a bill in equity to restrain the alleged infringement of a patent granted April 27, 1880, to the complainant, Wenzel Toepfer, for a malt kiln.

It is wholly irrelevant to inquire whether the patentee was obliged to limit himself by the ruling of the Patent Office. It is enough to say that he did so limit himself.

Although the patent may show features which were patentable and which, if properly patented, would render the defendants liable as infringers, such matters are abandoned to the public by the act of the patentee in accepting a claim which fails to comprehend the same.

Round rock shafts in tilting malt kiln trays are old and now common property, and it is an old expedient to tilt frames by square rock shafts; but where the patentee sees fit to limit his claim to a square rock shaft, the defendants who use a round shaft cannot be held liable. Also, while a patent may cover a new hook, it cannot prevent the use of an old door latch.

U. S. Circuit Court.—Eastern District of Pennsylvania.

GOOD *v.* BAILEY *et al.*

HEMP COMBING MACHINE.

BUTLER, *J.:*

Letters Patent No. 95,462, granted to John Good, dated October 5, 1869, for improvements in machinery for drawing and combing flax, construed strictly.

Where all the elements employed in forming the combination are old, and the combination alone is new, and this differs but slightly from that of machines previously manufactured or described, the claim for it can only be sustained in connection with the special mechanical devices employed in forming it.

The employment of other devices, though a combination of the same general character, yet producing a more perfect combination, one better adapted to the contemplated use, is not infringement.

Insect Remedies.

The report on entomology made by W. B. Alwood to the Columbus Horticultural Society, last winter, states that many remedies were employed on the two described cabbage worms, consisting of alum water of different degrees of strength, tansy water, tomato water, benzine, coal oil emulsions of different strengths, Hammond's slug shot, Cayenne pepper, half a dozen remedies from England, several preparations of tobacco soap and pyrethrum. None proved of any value except the tobacco soaps and pyrethrum. The tobacco soaps prepared with potash were quite efficient, the value of which was ascribed to the potash. Pyrethrum is recommended as the best remedy, being perfectly safe, easy of application, and more deadly on the worms than any remedy used. Powder of good quality, mixed with three times its bulk of flour, was found perfectly effective, applied with a dusting bellows. One pound, costing fifty cents, was enough to cover an acre if properly handled.

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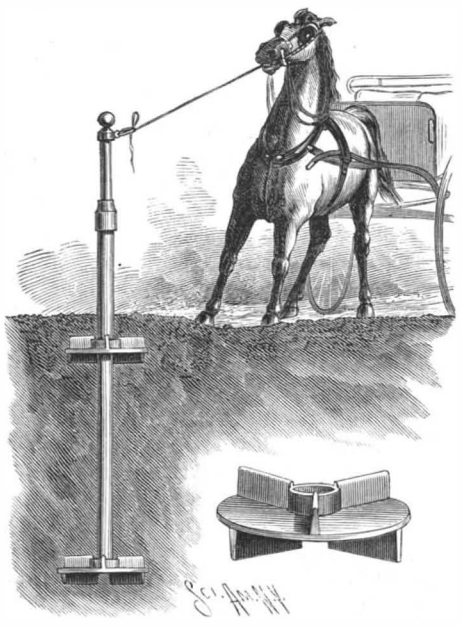
AN IMPROVED ANCHOR FOR POSTS.

A simply constructed anchor for hitching, fence and other posts, whereby great stability is obtained, is shown in the accompanying illustration, and has been patented by Mr. William P. Logan, of No. 726 Second Street, Trenton, N. J. The anchor is formed of a single metal casting, in the form of a circular plate with a

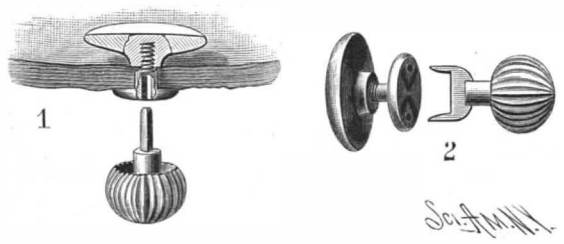


LOGAN'S POST ANCHOR.

central hole to receive the post, a hub surrounding the hole on the upper face of the plate, with a set screw for adjusting it on the post, and a series of rigid wings projecting from the upper and lower faces and radiating from the central hole. A detail view of the anchor is shown in the small figure, and two of them are applied to the hitching post, one secured to the lower end of the post and the other only a few inches below the surface of the ground, this setting giving great stability.

AN IMPROVED SEPARABLE BUTTON OR STUD.

A button or stud which may be readily attached to and detached from an article of dress, and which, when attached, will be firmly held until removed by hand, is shown herewith, and has been patented by Mr. Simon B. Simon, of No. 76 East Eighty-first Street, New York City. The body of the button, shown in Fig.

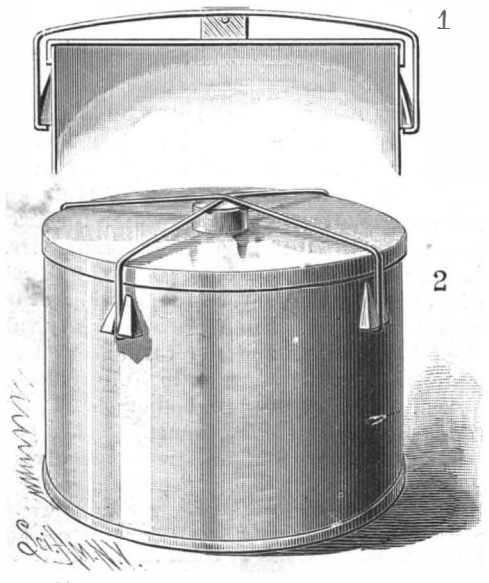


SIMON'S SEPARABLE BUTTON OR STUD.

1, has an integral neck with threaded aperture, and the shank is exteriorly threaded and made integral with the cap, which has in its center a rectangular recess, adapted to receive the square stem of a key. In inserting the button, the shank is passed through an opening in the cloth until the cap is brought in contact with the under side, when the body is screwed upon the shank and the cap and body firmly united by use of the key. In the button illustrated in Fig. 2, the cap is provided with two spaced apertures or recesses at each side of the center, adapted to receive the key, which is made in this instance with a bifurcated shank.

A SIMPLE COVER FASTENING FOR JARS.

A cover fastening for jars which is simple and durable in construction, and holds the cover very securely



PALMER'S COVER FASTENING FOR JARS.

to the jar or casing, is shown herewith, and has been patented by Mr. F. H. Palmer, of Long Island City, N. Y. It consists of a metallic casing having on two or more opposite sides, near the top, wedge shaped lugs or projections, each with a vertical groove on its outer face. The cover has in its center on top a post to which are secured metallic springs, extending at their outer ends to the side of the casing, where they are bent down and inward to form catches, the ends of the springs being in line with the grooves of the lugs. The post elevates the springs sufficiently to prevent them from coming in contact with the cover, and upon pressing the ends of the springs down until the ends of the catches pass under the lower ends of the lugs, the cover or lid is held firmly in place on the mouth of the casing.

Progress of the Natural Gas Industry.

"Few people outside of the natural gas region," said a large owner of gas wells in Washington County, Pa., "have any idea what enormous proportions the gas business has grown to. It may be said to be only about two years old in Western Pennsylvania, and more than 200,000 acres of land in Washington and adjoining counties have been drilled with gas wells. Nearly 150,000 tons of iron have been used in manufacturing the pipes through which the 500,000,000 cubic feet of gas that flow from the region daily are conveyed to the places using it. Over $25,000,000 is invested in the business by the fourteen organized companies that produce the bulk of the gas. The land and wells represent an outlay of $17,000,000. The wells now producing are capable of doubling the quantity now demanded for light and heat. Nearly 2,000 miles of mains are required for conducting the supply to consumers. It is estimated that the use of natural gas has displaced 25,000 tons of coal daily in Western Pennsylvania and Eastern Ohio alone. Besides the wells controlled by the great gas-producing companies, individual owners have wells for the supply of the smaller towns, and every village and hamlet in the region has enough natural gas running to waste every day to abundantly supply the same number of towns of 10,000 inhabitants each with light and fuel."

AN IMPROVED TOASTER.

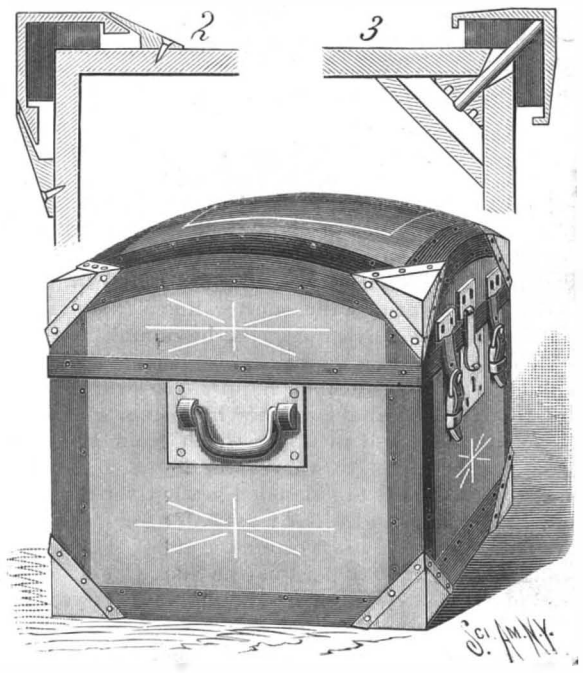
A simple and effective device to facilitate the making of toast over gasoline and similar stoves, preventing the gases from the flame from injuriously affecting the bread, is shown herewith, and has been patented by Mrs. Julia A. Downey, of Oberlin, Ohio. The toasting plate is preferably made of steel, of a size to fit the opening in the top of the stove, and has an upturned rear end provided with a suitable handle. A wire frame is hinged to the upturned rear end of the plate, the frame being hinged by rings that encircle the rear wire of the frame and pass through apertures in the upturned end. A catch at the front of the plate serves to hold the frame down thereon, the bread to be toasted being placed on the wire, when it is not burned by contact with the plate nor affected by the gases from the flame. This device has been thoroughly tested, and can be used on vapor or oil stoves, or those of a general character, or with open fires, as well as on gasoline stoves.

Etching on Glass.

A clean glass plate is coated, without being warmed, with a solution of gum dammar in ether. The exact strength of the varnish is immaterial, though it should not be too weak. When the ether has evaporated, we can light up our smoke factory—the benzoline lamp—and hold the glass, film downward, *in* the flame, moving it about with a circular motion to prevent the heat being concentrated in one part, which would probably crack the plate. The center of the flame consists of vapor of benzoline, which softens the dammar to such an extent that the soot is absorbed by the film as fast as it settles thereon. If this simple operation is properly done, a quarter or half plate sized glass can be smoked to opacity and will have a smooth, bright surface, which is in excellent condition for being etched, and is quite hard enough to form its own protection—that is, it does not require varnishing.—*Br. Jour. of Photo.*

A PROTECTOR FOR TRUNK CORNERS.

A device adapted for attachment to the corners of a trunk, to protect the trunk from being injured by rough usage in transportation, is shown herewith, and has been patented by Mr. Francisco Garcia, of No. 57 Beaver Street, New York City. A triangular base plate is provided, with inclined outer face, a central triangular recess, and a series of apertures adapted to receive screws. Within the recess is inserted a pyramidal cap, with a flange coming in contact with the inner surface of the base plate, thus limiting the outward movement of the cap, yet admitting of a movement inward. A rubber block with angular recess, adapted to fit snugly the trunk corner, is placed in the pyramidal cap, which is entered in the recess of the base plate, and, after the rubber has been brought into engagement with the trunk corners, the base plate is securely screwed to the sides of the trunk adjacent to the corners, as shown in section in Fig. 2. In the form of corner shown in Fig. 3, a triangular or pyramidal plate is held against the rubber cushion on the corner by a threaded rod made integral with the plate, and passing through the cushion and an aperture in

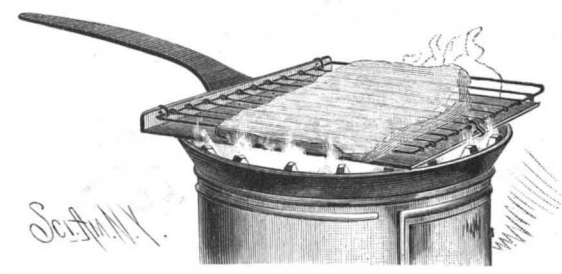


GARCIA'S TRUNK CORNER.

the trunk corner, the end of the rod within the trunk being provided with a nut, and the nut and rod being adapted to have play within a corner compartment formed in the trunk. In both cases an elastic block comes between the iron corner piece and the trunk, and allowance is made for the expansion and contraction of the block.

AN IMPROVED VEHICLE BODY SUPPORT.

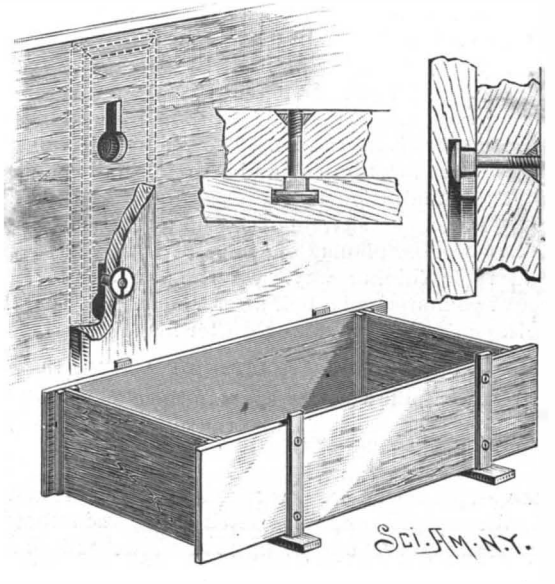
A method of attaching the panels of vehicles to their pillars or supports, whereby the panels will be securely and rigidly held in position and the inner faces of the panels will remain unbroken, is shown in the accompanying illustration, and has been patented by Mr. Fredrick M. Renner. One of the views represents a sec-



DOWNEY'S TOASTER.

tion of a panel with the support partly broken away, the other figures giving transverse sectional and longitudinal views and a perspective view. The face of the panel adapted for engagement with the supports is provided with aligning recesses extending through about half the thickness of the panel, a slot with undercut portion extending from each recess. Into each recess the head of a screw bolt is entered, the body of the bolt projecting out through the slot, suitable countersunk apertures being made in the pillars or supports to receive the bolts, by which the panels and supports are drawn to close and firm contact. The bolts, where they engage the slots, are preferably made square, to prevent turning, making a secure and rigid fastening.

For further particulars relative to this invention address Mr. Joseph Cabus, Jr., No. 206 West Eighteenth Street, New York City.



RENNER'S VEHICLE BODY SUPPORT.

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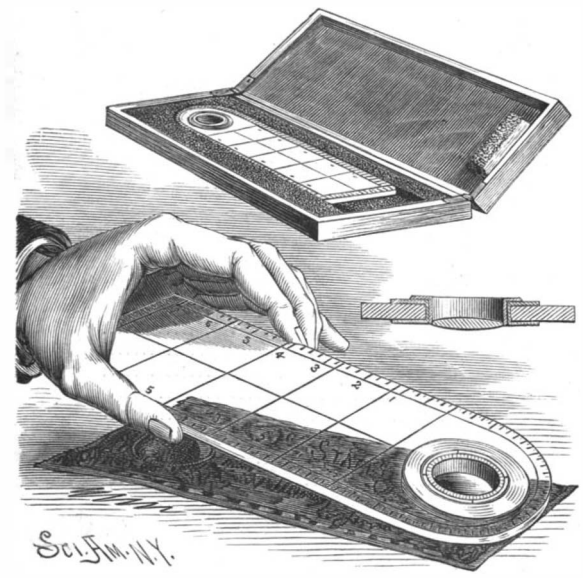
AN IMPROVED DISCOUNT MEASURING GLASS AND BANK NOTE EXAMINER.

A combination implement, especially applicable in examining bank notes, has been patented by Mr. Albert C. McMicken, of Winnipeg, Manitoba, Canada, and is shown herewith, as in use, in its case, and in section through the lens. It consists of a glass square at one end and semicircular at the other, and provided along the edges for the full length of a bank note with a scale that is marked or etched, for meas-



McMICKEN'S MEASURING GLASS AND MAGNIFIER.

uring notes and parts of a note, or ascertaining the exact size and length of signatures and numbering, for purposes of comparison. Along the edge of the semicircular end is also a scale, adapted to measure parts of circles, vignettes, curves, etc., and at this end is a magnifying lens of sufficient power to expose the fineness or coarseness of the fiber of the paper, and detect imperfections, the rim of the setting of the lens also having a scale. Upon the main body of the glass is marked the exact size of a bank note, this figure being subdivided into fifths and tenths, so that any approximate portion lost from a note may be quickly ascertained.

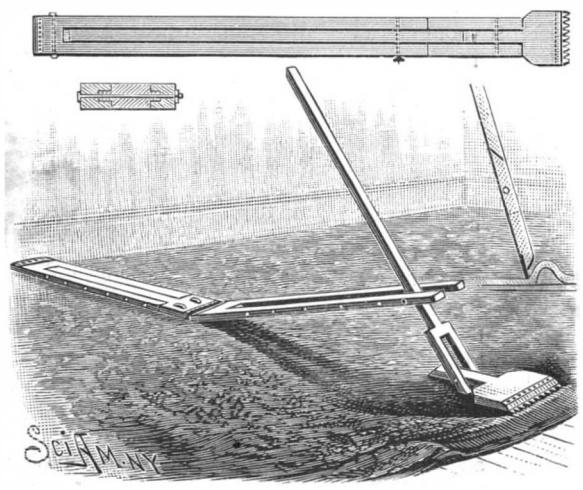
A Mill Engine Stands Fire.

A very singular incident was noted in connection with a recent mill fire in Carlton, Mich. The building was burning fiercely, but the big engine which drove the machinery continued to run all through the blaze, and by that means was saved from destruction, though there was not a wall standing on any side of it when the fire had finished.

The pumps were also running, and kept the boiler supplied, so that there could be no explosion. It was a peculiar spectacle to see the engine driving away at a slashing speed in the midst of the flames, but the motion somehow saved it from fire. All the rest of the machinery was a total loss.

AN IMPROVED CARPET STRETCHER.

A simple carpet stretcher, easily operated by a single individual, and which can be readily adjusted for use in various sized rooms, is illustrated herewith, and has been patented by Mr. Charles T. Manter, of Bismarck, Mo. A lever is adjustably pivoted near the forward end of a slot in a light rectangular frame, which can be closed up when not in use, as shown in one of the small views. This lever at its forward end has a slot in which is pivoted the shank of a stretcher head provided with a toothed plate. An auxiliary extension arm is provided to lengthen the body of the stretcher, having journaled therein rollers to prevent the binding



MANTER'S CARPET STRETCHER.

of the carpet to the floor by the thrust of the stretcher, thus allowing the carpet to stretch evenly and smoothly clear across the room. In operation, one end of the auxiliary arm is placed against the base board, the other end being drawn out the approximate distance and placed in contact with the inner end of the stretcher, which has been adjusted to reach nearly across the room. The lever of the stretcher is then raised nearly upright, to engage its toothed head with the carpet, a slight bearing down on the lever causing the head to assume a horizontal position, when the edge of the carpet is readily carried forward by further bearing on the lever, and thus held ready for nailing.

Exercise in the Treatment of Heart Disease.

For generations the main idea in the treatment of organic heart disease has been physical rest to diminish the labor of the damaged organ. We have been in the habit of prohibiting all forms of active labor to the sufferers from cardiac disease, and the principle of our treatment has been the unexpressed but ever present idea, accepted as a self-evident axiom, that perfect rest was the best means of securing muscular compensation. Professor Oertel's experiments and results have come with startling surprise upon those who forgot to distinguish between a useful principle and the exceptions which the multiformity of disease renders it imperative to recognize. As is well known, he treats a considerable proportion of cases of organic heart disease by regulated exercise, especially graduated ascents of mountains, and his results place the value of his method beyond reasonable dispute. There is nothing really surprising either in his treatment or the success which has attended it. A little reflection will suffice to convince us that, while rest is often useful, and indeed quite indispensable, in heart disease, there are yet many cases in which well regulated exercise will improve the nutrition of the cardiac muscle, as of the rest of the muscular system, and hence tend to the promotion of circulatory vigor.—*Medical Record.*

SECURING PICTURES TO TOMBSTONES.

A frame or casing adapted to hold pictures on tombstones in such way that the pictures will be fully protected from injury by the air, rain, etc., is illustrated herewith, and has been patented by Mr. Solomon R. Miller, of Mount Union, Huntingdon County, Pa. A metallic casing, with lugs by which to secure it to the tombstone or monument, has a recess in which fits a second casing, preferably of rubber or other waterproof elastic material, and in this second cas-

MILLER'S TOMBSTONE PICTURE ATTACHMENT.

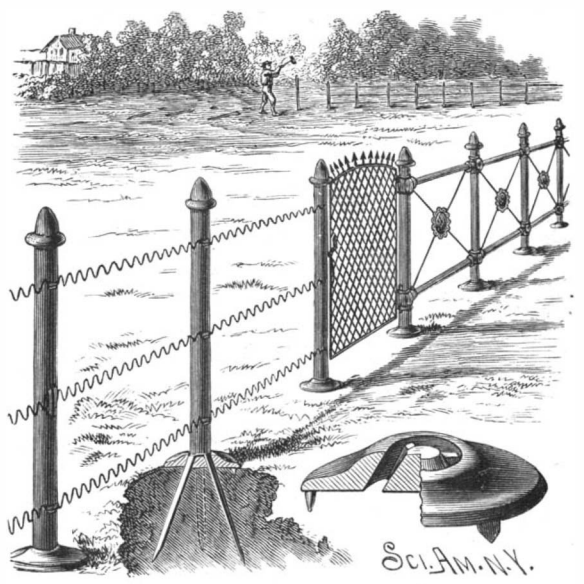
ing is placed the picture, the glass plate covering it being forced into the sides of the inner casing, so that a part of each side projects over the top edge of the glass. The lid or cover is fulcrumed on a screw secured to the casing, and fits firmly over the outer edge of the sides of the rubber casing The cover may be provided with a suitable inscription, and the frames are preferably made of white metal or bronze, silver plated, or of pure silver or gold, and let into the marble or other material of the tombstone.

Trial of New Weapons.

Nine preliminary rounds for a range trial of the new 12 inch breech loading mortar were fired at Sandy Hook, November 15, in the presence of General Benet, Chief of Ordnance, Captain Smith, and the Testing Board. With the mortar placed at 45 degrees elevation and with a charge of 65 pounds of powder and shell weighing 265 pounds, the following results were obtained: Initial velocity, 1,037 feet; pressure, 2,700 pounds; range, 9,385 yards, or 5⅓ miles. Although the preliminary test was not made to demonstrate the accuracy of fire of the mortar, the ordnance officers are well satisfied, from an examination of the shot after firing and other observations, that they were not wrong in believing the breech loader to be superior in this regard to the muzzle loader. Further experiments to test endurance, accuracy of fire, and range will be carried on during the present and coming month. The 8 inch breech loading steel rifle was also subjected to a range trial, November 15, and very satisfactory results obtained. With a charge of 95 pounds of powder, which is 15 pounds less than the usual charge, a 289 pound projectile, and the gun placed at 17½ degrees elevation, the shot was fired a distance of six miles and 138 yards. The muzzle velocity recorded was 1,800. With the regular charge of powder and weight of projectile it is figured by the officials at Washington that a range of 6½ miles should be reached.—*Army and Navy Journal.*

AN IMPROVED FENCE POST.

A simple, light, and durable post, which can be easily and cheaply made and set up, to afford a strong support for the wire or other longitudinal stringers or rails of a fence, is shown herewith, and has been patented by Mr. Louis Turnberger. The post is a metal tube or pipe, with slots dividing its lower end into parts or tongues, which, when the post is driven into the ground, spread outward and form prongs to firmly anchor the



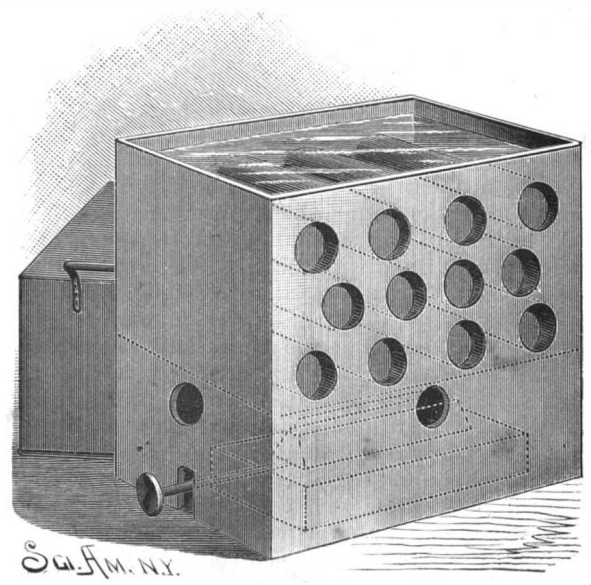
TURNBERGER'S FENCE POST.

post. The ground plate has a raised central portion, with prongs on the bottom to hold it in position, and around its center are segmental slots, corresponding with the number of prongs of the post, and made flaring downward and outward from the top of the plate, thereby providing at the center of the plate a core of general conical form. This ground plate is first fixed in position by its prongs, being partially bedded in the ground, if necessary, when the post, with its slotted lower ends placed in the downward flaring slots of the plate, is driven down, forming spreading prongs, which give a good hold on the ground. The wire stringers of the fence are entered into transverse notches made in the post, where they may be held by a vertical wire having slight bends, and an ornamental cap is screwed or driven on the top. The post is equally adapted for use with other forms of fence-making materials, the fastenings being made in any approved way.

For further information relative to this invention address Mr. John P. Mern, of No. 80 Schaeffer Street, Brooklyn, E. D., N. Y.

A HEATER FOR GIANT POWDER AND OTHER EXPLOSIVES.

An apparatus designed to promote convenience, economy, and safety in heating and thawing giant powder and other explosives usually put up in sticks or packages is represented in the accompanying illustration, and has been patented by Messrs. Thomas and Alfred J. Rundle, of Iron Mountain, Mich. It consists of an open topped tank having a series of open ended tubes, with a slip cover or hood adapted to close the tank and the ends of the tubes, there being an apartment below the tank proper to hold a lamp or other means of heating the water in the tank, the fire being so inclosed as to protect the explosives from possible contact therewith. Each tube is of sufficient ca-



THE RUNDLE HEATER FOR GIANT POWDER, ETC.

pacity to hold an ordinary stick or package of explosive, which may be inserted or removed from either end, or, if liable to break or stick in the tube, a package can be readily pushed through, and the heater thus kept clear of all remaining powder or explosives.

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Dangers Incident to the Use of Oil upon the Waves.

According to the *Gazette Geographique*, this method of calming the waves has been long known by fishermen upon the northern coasts of France, and is still sometimes practiced there. But it should be a subject of fear to smaller boats that follow in the wake of the vessel that has used the oil; because to the absolute calm suddenly succeeds a still more violent agitation of the waves, and this constitutes a great danger, from which the vessel caught in it often cannot escape. This last fact possesses some importance, and seems hardly yet to have been awarded sufficient consideration. The following incident proves the reality of this danger. On the 20th of last September a lifeboat from Calais went out on the sea to make some studies on the use of oil as a means of quickly calming the violence of the waves. It was once more proved that oil poured upon the water around a ship suppressed radically the largest waves. Within a relatively restricted area a ship was no more troubled; but outside of the circle of action the waves became more furious, they took in a certain sense their revenge, and if another boat were near, it would have been exposed to great danger. These troubles were felt by the lifeboat. Having gone outside of the protecting zone, and no more oil being thrown on the water, one of the sailors was caught by a wave (*coup de mer*). His oar was snatched off him, it caught him around the waist and threw him in the water. Fortunately he was rescued. As we have said, this way of calming the sea is not new. In 1847, when mail service was tried at Boulogne, it was used in embarking from the dock in boats, yet did not always prevent accidents.—*Revue Scientifique.*

A Furnace and Rolling Mill.

A person who has never witnessed the process of converting ore into iron, and then rolling the metal into bars, will be interested in the impression made upon a reporter who witnessed the process, as related by him in the Philadelphia *Record:*

To trace a lump of crude pig iron through the processes that refine and shape it for use is an interesting experience, and darkness adds to the strangeness and weird aspect of the scene. This is the way it looks to an uninitiated observer. The process begins with the puddling furnaces. Ranged about the sides of the great building are a score of furnaces of peculiar construction. These furnaces, which are low and flat, are charged with some hundreds of pounds of broken pig iron, which is fused by the intense heat until it becomes semi-fluid. Then comes the hard work of puddling, which is simply kneading the half molten iron. Before the furnace the puddler stands, and, thrusting a heavy iron bar through a small hole in the door, he works and turns the pasty mass, forming it into huge balls, which must be carefully kept separate from each other, else they fuse together into a mass which cannot be removed unless the furnace be taken apart.

At night the scene in the puddling mill is weird and picturesque in the extreme. Here and there in the darkness glow the fiery eyes of the furnaces flashing a bright light upon the swarthy and half-nude forms of the workmen as they tug and pull on the molten metal with long iron bars. The roaring of the fires, the hiss of escaping steam, and the clang of iron bars add to the wildness of the scene. For about an hour and a half the kneading process continues before the metal is to be withdrawn. This means incessant labor by the puddler, and labor of the hardest and hottest kind. With no clothing but a pair of overalls, and working in a temperature of 160 degrees, the men perspire so freely that streams of water run from their bodies.

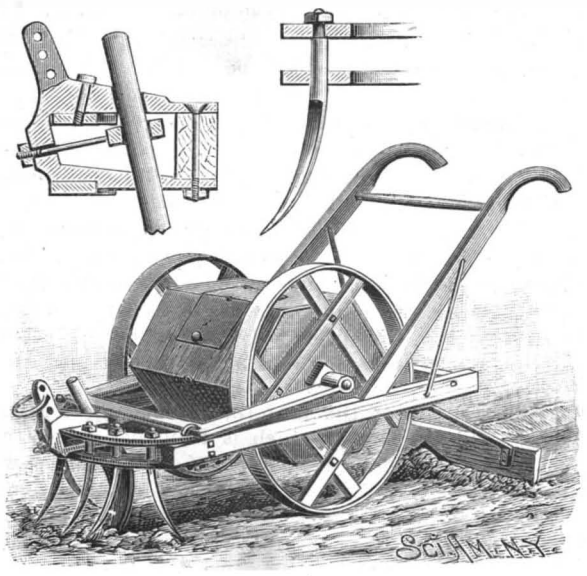
As long as the perspiration continues freely they are safe, and to insure its continuance they drink freely of water, gulping down three or four gallons in a day without any injurious results. But if the perspiration should stop and the men continue to work, prostration would soon follow. The heat is so intense and the work so enervating that the puddlers, after standing before the furnace for an hour and a half, rest three-quarters of an hour before resuming operations.

An hour and a half of puddling and the iron is ready to be drawn. Up goes the door of the furnace, showing a mass of flame too dazzling to look upon with the naked eye. With a big pair of tongs a lump of glowing iron is picked out of the flames and swung along to the "squeezer." This is a circular revolving machine that takes the misshapen mass of iron and rolls it over and over, crushing it into a rough block of solid iron. The "squeezer" is suggestive of a pair of monster jaws crunching and crushing the molten food which is thrust into it, while the melted cinder trickles out between its huge teeth. After leaving the "squeezer" the lump of iron is ready to be rolled into shape, and this furnishes the most interesting of the processes. Away across the iron floor upon an iron truck goes the lump from the furnace.

A huge engine, with its cylinder high in the air, turns the rolls, and as the lump of iron is thrust between the rolls, there is a trembling of the ground as it is caught and pulled through. Back it comes through another part of the roll, more regular in shape and much longer than when it started. Back and forward it goes and comes through the rolls, faster and faster until it comes from the last roll and rushes across the floor in a serpentine path, looking a veritable reptile of hideous appearance. A workman clutches the glowing snake by the tail with a pair of tongs and drags it aside. Another man thrusts it before a swiftly revolving saw, there is a deafening noise and a shower of sparks, and the iron bar is nearly cut in two pieces. A few blows from a huge wooden mallet to straighten the red hot bars, and they are dragged aside to cool. To one unaccustomed to such sights a rolling mill appears to be a place of wild confusion and disorder. The rumble of the rolls, the rattle and clash of the tongs and chains, the crash of the huge saws as they cut the red hot bars asunder, and the ever-flying showers of sparks, make pandemonium for a nervous person. Even a steady man is apt to be startled by a sudden yell by one of the hurrying laborers, or by an explosion like that of a cannon close by his side. A stream of water constantly plays upon the rolls, and as it occasionally gets into the cracks in the red hot iron passing through the rolls, there is an explosion that echoes far up the hill across the river.

AN IMPROVED COTTON PLANTER.

A machine which is designed to pulverize the ground, make the furrow, plant the seed at regular intervals, and cover them, has been patented by Mr. Nathaniel R. Rodgers, of Red Fork, Ark. Apertured segmental plates attached to the front end of the frame have aligning apertures, in which are fixed harrow teeth,



RODGERS' COTTON PLANTER.

triangular in cross section below the plate and circular above, as shown in one of the small figures, the teeth being calculated to pulverize the earth, but being so secured that they will turn in their sockets should any hard obstruction be met. Diagonally inward, between the plates and the front beam of the frame, is fixed the shank of a vertically adjustable plow, as shown in another of the small views. Hinged to the front part of the main frame is an auxiliary frame, in whose side bars are journaled a transverse shaft, on which is a polygonal-faced seed carrier, supported by drive wheels. The seed carrier has apertures centrally at the angles of its face which align with the plow, so that the carrier, in its onward movement, drops the seed at regular spaces in the furrow. Rearwardly extending spring arms carry a covering board, with a V-shaped slot cut centrally in its bottom edge, this board throwing the soil upon the seed and forming a ridge over the furrow when the row has been planted.

Deep Wells.

The deepest well drilled in the United States is that of George Westinghouse, at Homewood, near the city of Pittsburg, which, on December 1, 1886, had reached a depth of 4,618 feet, when the tools were lost and drilling ceased. The Buchanan farm well, of the Niagara Oil Company, drilled by Fred. Crocker, in Hopewell Township, Washington County, is 4,303 feet deep. The Rush well, of the Niagara Oil Company, in Washington County, was abandoned at 3,300 feet. The deep well of Jonathan Watson, near Titusville, was drilled about 3,500 feet. J. M. Guffey & Co.'s well, on the Walz farm, at West Newton, Westmoreland County, was drilled to a depth of 3,500 feet. The well of Isaac Willets, at Sargent's Mills, near Sycamore, in Greene County, was abandoned at 3,008 feet.

The deepest bore hole in Europe is at Schladebach, near Kotschau Station, on the railway between Corbetha and Leipzig, and was undertaken by the Prussian government in search for coal. The apparatus used is a diamond drill, down the hollow shaft of which water is forced, rising again to the surface outside the shaft of the drill and inside the tube in which the drill works. By this method cores of about fifty feet in length have been obtained. The average length bored in twenty-four hours is from twenty to thirty-three feet, but under favorable circumstances as much as 180 feet has been bored in that time. Other deep holes are as follows:

	Feet.
Domnitz, near Wettin	3,287
Probat-Jesar, Mecklenburg	3,957
Sperenberg, near Zossen	4,173
Unseburg, near Stassfurt	4,242
Lieth-Elmshorn, Holstein	4,390
Schladebach	4,515

The dimensions of the bore hole at Schladebach are as follows;

Depth from Surface.	Each Size Bore. Feet.	Diameter. Inches.
189·5	189·6	11·0
605·7	416·1	9·0
661·8	56·1	7·3
1,906·5	1,244·7	4·7
2,259·8	353·3	3·6
3,543·4	1,283·6	2·8
4,069·9	526·5	1·97
4,514·6	444·7	1·88

The various strata passed through are as follows:

	Feet.
Soil and sand, about	16
Clay	66
Sandstone (Bunter)	459
Anhydrite	59
Brine spring	—
Magnesian limestone (Zechstein)	144
Gypsum	36
Anhydrite	295
Marl slate (Kupfersheifer)	3
Sandstone (Kothliegendes)	3,435

The bore hole, which in January, 1885, had reached a depth of 4,560 feet, was commenced in June, 1880, but left after a year's work; recommenced at the end of 1882, and is still progressing. The cost up to January, 1885, was about $25,000.—*Prog. Age.*

A New Hektograph.

The latest issue of the *Papier Zeitung* gives the following instructions for making a cheap and handy hektograph: Soak 4 parts of best white glue in a mixture of 5 parts pure water and 3 parts ammonia, until the glue is thoroughly softened. Warm it until the glue is dissolved, and add 3 parts of granulated sugar and 8 parts of glycerine, stirring well and letting it come to the boiling point. While hot, paint it upon clean white blotting paper, with a broad copying brush, until the blotting paper is thoroughly soaked and a thin coating remains on the surface. Allow it to dry for two or three days and it is then ready for use. The writing or drawing to be copied is done with ordinary hektograph or aniline ink upon writing paper. Before transferring to the blotting paper, wet the latter with a sponge or copying brush and clean water and allow it to stand one or two minutes. Place the written side down and stroke out any air bubbles and submit the whole to gentle pressure for a few moments, remove the written paper, and a number of impressions can then be taken in the ordinary way. When the impressions begin to grow weak, wet the surface of the hektograph again. This hektograph does not require washing off, but simply laying away for 24 to 36 hours, when the surface will be ready for a new impression.

New Envelope Machinery Wanted.

The manufacturers of envelopes have lately united to form a trust, and have advanced the prices of envelopes. It is expected that if any new concern were to commence business independently of the trust, the latter would be able temporarily to undersell and destroy the new comer. In this land of liberty there is no protection against such combinations except the ingenuity of the inventor. What is now wanted is improved machinery for making envelopes, by which greater rapidity and economy may be secured. An opposition to the trust which could command any genuine improvements in the direction indicated would enjoy a bonanza in the line of business. The problem suggested is a very difficult one. Some of the envelope machines now belonging to the trust are marvels of ingenuity and perfection. To beat them is no easy task. A first class envelope machine now costs two thousand dollars.

Perpetual Motion Inventors.

George Stephenson, England's great engineer, began his experiences as an inventor with the perpetual motion problem, for which he constructed a machine. His biographer describes it as consisting of a "wooden wheel, the periphery of which was furnished with glass tubes filled with quicksilver; and as the wheel rotated, the quicksilver poured itself down into the lower tubes, and thus a sort of self-acting motion was kept up in the apparatus, which, however, did not prove to be perpetual."

Indeed, not a year passes but some new enthusiast lodges at the Patent Office the specifications of some machine for perpetual motion. This is not in itself considered evidence of insanity, but it is unquestionably regarded by some as proof of mechanical aberration.

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Correspondence.

Self-Mending Insects.

To the Editor of the Scientific American:

One of your correspondents asks for a scientific reason or for an explanation of this most marvelous operation of the self-mending snake and the earwig; and whether any other living objects do the same.

In the extract below, taken from the Encyclopædia Britannica, he will find a statement of as marvelous operations and of still more marvelous reasons or explanations (so-called scientific explanations):

"The spontaneity of certain polyps under injury is a good example of the indwelling power of all the cells and tissues to return to the established order, to the order and harmony which had been slowly acquired, and of which the memory is vividly retained. Trembla cut a hydra longitudinally, and 'in an hour or less,' says Paget, 'each half had rolled itself, and seamed up its cut edges so as to be a perfect hydra.' He split them into four; he quartered them; he cut them in as many pieces as he could; and nearly every piece became a perfect hydra. He slit one in seven pieces, leaving them all connected by the tail, and the hydra became seven-headed, and he saw all the seven heads eating at the same time. . . .

"This spontaneity resides in every living thing, and its efforts are directed by the memory of what the species had come through in reaching its place in the scale of organization. It is able, indeed, to make perfect reparation for injuries or losses only where the cells are little differentiated into tissues, or where the tissues are little specialized for diverse functions. In all animals, and most notably in the higher, this spontaneity is most effective for repair in the periods of development or growth."

So much from the Britannica. It is a pity that the learned pathologist has not stated where the memories are located, or how many such memories belong to each organism. Perhaps each cell contains one for itself, or each organism the sum of all the memories of its ancestry.

R. O. GERCKE, M.D.

Augusta, Ga.

The Mineral Wealth of Siberia.

Referring to the resources of coal and iron in Siberia, a writer in one of our English exchanges says:

It is one of the finest undeveloped countries in the world, and it is really difficult to exaggerate the enormous wealth of this gigantic region. The soil is of almost inexhaustible wealth and the crops magnificent. There is almost no limit to the production of the land. The Russians themselves have but an imperfect idea of the immensity of their natural wealth, and other people outside Russia cannot realize it at all. Siberia, so far from being a region of desolation and of death, is a northern Australia, with larger rivers, more extensive forests, and mineral wealth not inferior to that of the island continent. In a very few years Siberia will be bridged from end to end with railways, and in this matter the Russian government is showing a large and wise policy. The magnificent water communications—for it is irrigated from end to end with some of the largest rivers in the world, navigable for thousands of miles through fertile and richly wooded lands destined to be the home of millions of colonists—and a canal is now being made between the Obi and the Yenisei, which will enable goods to be conveyed by water the whole way from Tiumen to beyond Lake Baikal. At Tiumen there is a railway which passes through the Ural mountains to Ekaterineburg and Perm, through the heart of the richest mining district in western Siberia.

The Manufacture of Japan Soy.

At a recent meeting of German chemists a Mr. Erich communicated a paper on the preparation of Japan soy, a product of which the details of manufacture are as yet imperfectly known. Soy has been manufactured in Japan for over a thousand years, and forms a very considerable article of consumption in that country and throughout the East. There are many factories of the condiment in the country, one of the largest being at Tokio, where considerably over one million gallons are specially prepared for export every year. The principal ingredients known to be used in the manufacture of soy are a very hard long-awned variety of barley, common salt, soya beans (*Dolichos soya*), a specially prepared ferment, and water. The soy beans are roasted like coffee, the barley is partly roasted and partly malted. The roasted parts of the barley and the beans are soaked in cold water, cooled, and preserved by the addition of a liberal dose of common salt. To this are added first a diastase solution, and afterward a specially prepared ferment, which causes an extremely slow fermentation, but without any considerable formation of carbonic dioxide or alcohol. The degree of strength of the soy depends upon the time used in the process of manufacture, which varies from one to three years. If kept cool and out of the light, soy can be kept good for a very long time, but the action of light and free access of air cause fermentation.

PHOTOGRAPHIC NOTES.

Illuminating Negatives by Artificial Light for Copying.—In an article giving an account of the various methods of illuminating negatives by oil, gas, electric, or the oxyhydrogen light the *Br. Jour. of Photo.* describes a simple method, which consists in the use of magnesium ribbon. It says:

Since magnesium has at last come down to so moderate a price, there remains no valid reason why a cheap, convenient, and highly powerful light should not be available for the purpose we indicate wherever lantern slides or enlargements are made.

The simplest mode of using it scarcely requires any apparatus or preparation, all that is necessary being to ignite it at a sufficient distance from the negative, with or without the intervention of a translucent screen; or the light may be allowed to fall upon a white sheet and passed, by reflection, through the negative to the camera, in which case the perfection of uniformity is secured. But though these makeshift methods may answer very well for lantern slide purposes where the sensitive plate is exposed in the camera, and thus protected from extraneous light, for enlarging they are wholly useless, since the sensitive surface is usually freely exposed, and it therefore becomes necessary to inclose the light in a suitable lantern. This is not a difficult task, and as, with the aid of magnesium, it removes all the difficulty of equal distribution of the light without inconveniently lengthening the exposure, no doubt many amateurs, in addition to those who have addressed us on the subject, will think it worth while to erect a simple lantern on the lines of the one we shall describe.

This consists, roughly, of a wooden body with ground glass front, and acts at the same time as lantern and reflector combined, the ground glass intercepting the whole of the light, both direct and reflected, and becoming converted into a powerfully actinic radiant suitable for either enlarging or reducing purposes and for negatives of any size. The details of construction are so simple as to scarcely require a diagram, so we shall endeavor, by means of a verbal description, to make the arrangement clear.

We may premise that though the instrument we describe is constructed for use with negatives up to 12 × 10, and is equally available for quarter plates, it might be made of any smaller dimensions if preferred, though, as nothing is lost in the larger size, and little added to the cost, we should strongly recommend the 12 inch square front to be adhered to.

The shape of the lantern, or reflector, is a hollow pyramid, the base of which is 12 inches square, clear, and the sides slope at an angle of sixty degrees, which will make the height of the pyramid, roughly, between 10 and 11 inches. Such are the interior shape and dimensions; but for convenience in construction, as well as in use, the structure may be built up in the following manner:

Cut two pieces of wood accurately to the shape and internal dimensions of the side of the reflector, and cut also two rectangular pieces of such size that, when placed together to form a V-shaped trough, the two triangular pieces will fit in at the proper angle to complete the reflector. The square ends of the two rectangular sides will then serve as feet, upon which the reflector will stand without further assistance. Before fastening the sides together, mark on each a line parallel with, and 6 or 7 inches from, the front or base edge, and nail or glue on four fillets of wood to form a rabbet or projection against which to fix a square of glass. In each of the triangular pieces which will form the top and bottom of the lantern when in use cut a hole an inch and a half or two inches in diameter, for ventilating purposes, the upper one to be fitted with an external chimney to carry off the smoke.

When the frame is put together, let it be lined with white paper or painted dead white. Fit a square of clear glass into the rabbet formed by the fillets already mentioned, and in the center of this cement a disk of opal glass about an inch in diameter. The clear glass will convert the back portion into a separate lantern, and by reducing the space assist in carrying off the smoke, while the opal disk softens the intense brilliancy of the burning magnesium, and helps to equalize the illumination. The front of the arrangement is provided with a frame, into which a sheet of ground glass slides, with a second groove at a distance of about an inch, into which carriers to hold different sized negatives can be inserted. So far as the lantern is concerned, nothing now remains but to supply the illuminating arrangement.

This of the simplest. Procure two narrow brass tubes, 5 or 6 inches in length and an eighth of an inch in internal diameter. Saw off the apex of the pyramid and replace it with a flat piece of wood, through which the two tubes are passed, one a quarter of an inch above, the other a quarter of an inch below the center, and reaching to an inch or so of the clear glass screen, or 8 inches from the ground glass front. The upper tube serves as a guide for the magnesium wire. The lower tube carries a strand of cotton wick, kept saturated with spirit, and serves to light the magnesium as it is passed through the upper tube. If the outside end of the wick tube be bent at a right angle, it may be passed through a cork into a small bottle of methylated spirit, and so converted into a permanent spirit lamp. A small aperture cut in one of the sides and glazed with blue glass will enable the operator to watch and regulate the supply of magnesium during use.

When required for work, all that is necessary is to light the spirit lamp by passing a taper through the air inlet at the bottom and to allow that to burn continuously. When an exposure is to be made, a strand of magnesium ribbon is passed slowly, but regularly, through the upper tube, and being ignited by the spirit flame, continues to burn as long as the supply is kept up. If the reflector be constructed of the shape and angle given, and the light arranged at a distance of 8 inches from the front glass, the illumination over a surface of a foot square will be brilliant and uniform in the highest degree.

Not the least recommendation of this apparatus beyond its efficiency is its economy. It may be made by any one who can use tools at all, for a few shillings, and will serve a variety of purposes.

While the above described arrangement is well adapted to the burning of ribbon, we can suggest a more simple plan, which consists of inserting a metal sheet on the bottom of the box, then placing upon it the new magnesium powder and gun cotton compound, and igniting and flashing it by means of a wax taper inserted through a small hole in the back of the box, or by a platinum wire made red with an electric current.

Chromo-Collotype Process.—One of the latest inventions patented in this country is the chromo-collotype or chromo-lichtdruck of F. L. Hosch, of Munich. As many of the readers will probably remember, the late Jos. Albert, of Munich, many years ago invented a similar process. He photographed a painting three times. The first negative was taken through a red colored glass plate, the next through a blue glass plate, and the last through a yellow glass plate. In this way he obtained three negatives, all of the same size, but in taking of which respectively the rays of the three primary colors—red, blue, and yellow—had been absorbed. From these negatives he secured three lichtdruck plates, one from each, the first of which he printed in red, the second in blue, the third in yellow, one over the other, and thereby he obtained more perfect pictures than could possibly be got by any other method. The Hosch process, though being also based on photography, is a different one. In this process a painting is photographed, and behind the resulting negative is exposed a lichtdruck plate. From this plate as many prints as color plates are required for the finished picture are taken on well sized paper. The prints, or off-sets, are fixed to cardboard or to glass plates, and with specially prepared oil colors painted gray on gray, then they are all photographed again. In the negatives thus obtained, the highest lights, and also the margins of the picture, which should print perfectly white, are backed, then lichtdruck plates are exposed behind the prepared negatives, which are washed, etched, and respectively printed in the colors yellow, red, flesh tint, and blue, one over the other. The advantages of this process are that a considerably smaller number of color plates are sufficient for the reproduction of a painting than in the case of chromo-lithography, and that the finished pictures are much more perfect and of a greater softness than chromo-lithographic prints. On the other hand, more time is occupied by this process, and the printing and plates are more expensive.

Sresniewski's Gelatino Emulsion.—Professor Eder, in reviewing a new handbook of photography, written by a Russian dry plate manufacturer, M. Wiatcheslaus Sresniewski, describes a new method of preparing gelatine emulsion. It is a modification of Mr. Henderson's process, and consists in the following:

No. 1.

Potassium bromide	8 grammes.
Distilled water	20 c. c.
Gelatine (Nelson's No. 1)	1 gramme.
Carbonate of ammonia	1 "
Potassium iodide	0·2 "

No. 2.

Nitrate of silver	10 grammes.
Distilled water	40 c. c.
Nitric acid (10 per cent solution)	2 drops.

No. 3.

Alcohol, 95°	50 c. c.
Ammonia	4 "

(Temperature, 68° F.)

First add No. 2 to No. 1, then mix it slowly, and well shaking, with No. 3. The emulsion is kept for eight to ten hours in a room of the usual temperature. At last add a warm solution of—

Gelatine	18 grammes.
Water	120 c. c.

and finish by precipitating with alcohol, or by setting and washing with water.—*Hermann E. Gunther, in Photo. News.*

THE Klamath Indians have built up a considerable carrying trade along the Pacific coast. In their large canoes, hewn out of the solid trunks of immense trees, they carry dairy and farm products for the settlers and return with groceries and other supplies.

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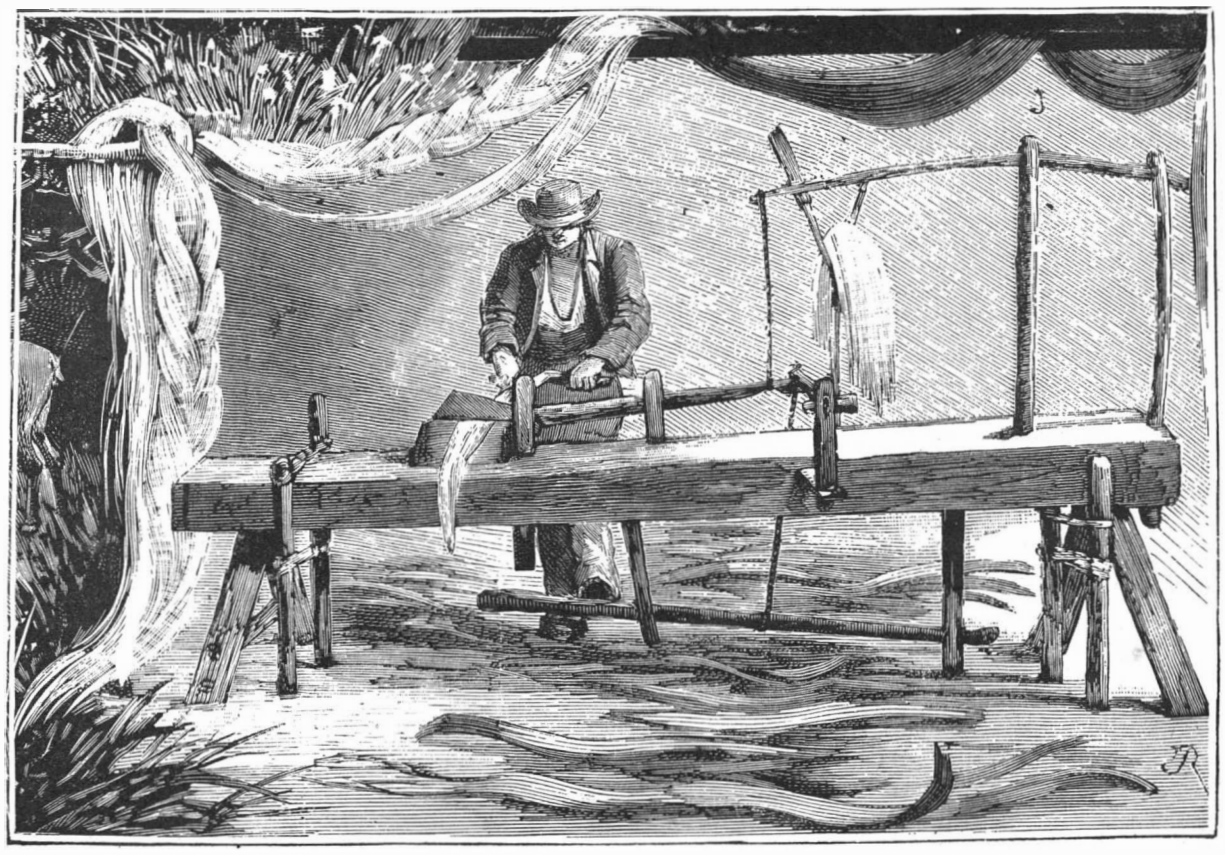
SEPARATING THE MANILA FIBER.

In our paper for September 17 we published a letter from a correspondent in Madrid, calling attention to the need for a new mechanical invention to facilitate the separation of the fibers of the abaca plant, this being the plant from which the well known manila ropes and other goods are made. At the interesting exhibition now in progress at Madrid, of the products of the Philippine Islands, machines such as are now used at Manila and dependencies are shown in operation. We give an engraving of one of these machines. As will be seen, it is a rough and primitive affair, worked by hand, slow and tedious; but the entire product of this class of fibers, vast in extent, is separated by this means. There is clearly room for an improvement.



MACHINE FOR SEPARATING MANILA, OR ABACA, FIBERS.

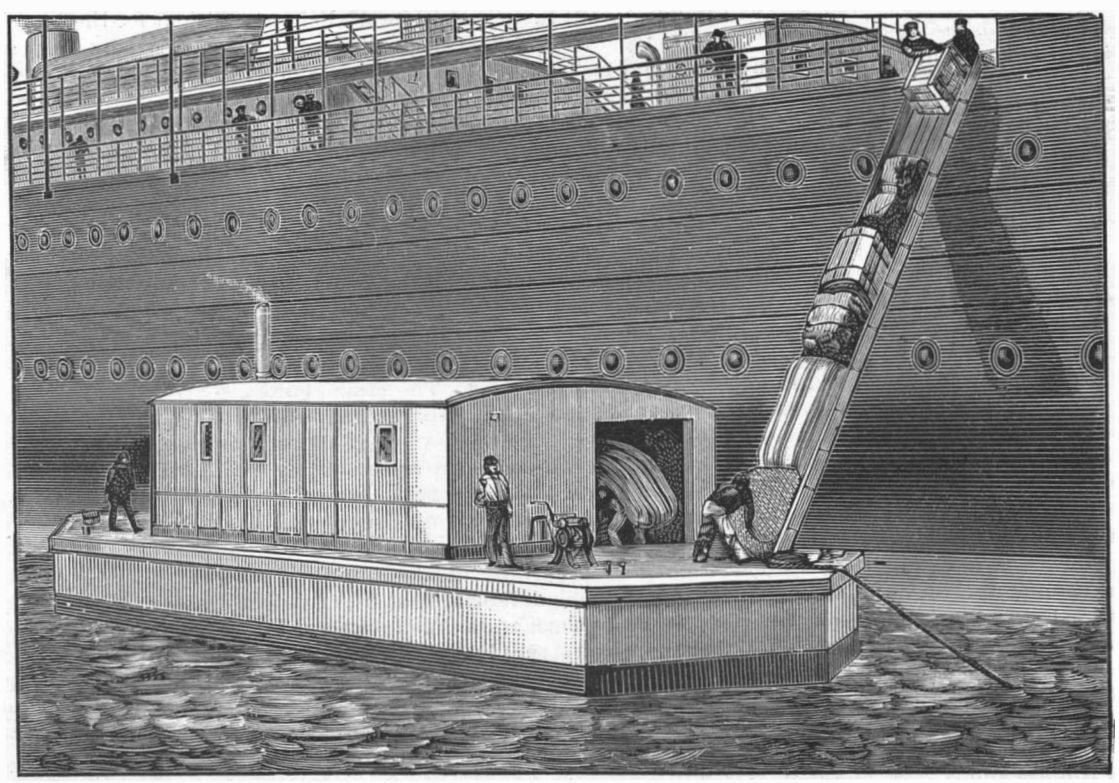
FRENCH DISINFECTING APPARATUS.

The preparatory labors of the International Congress of Hygiene, which met at Vienna, September 26, permit us to assert that France today possesses a stock of disinfecting apparatus much superior to that of other nations, for the reports published by the hygienists of various countries well show that the French apparatus are the only ones capable of assuring the application of this measure within the shortest time, with the lowest pressure, and at the lowest temperature. It is a question, be it understood, of the destruction of pathogenetic micro-organisms in linen, clothing, bedding, rags, etc. As for the disinfection of rooms and furniture, that has to be done with the aid of chemicals, gaseous or liquid; but these cannot penetrate the aforementioned objects quickly enough, and without injury.

The two new apparatus that we desire to make known are a disinfection boat and a movable disinfection stove.

Professors Brouardel and Proust and Dr. Rochard, French delegates to the International Sanitary Conference at Rome, in 1885, dwelt at that time upon the correlation that necessarily exists between the guarantees given to public health by the measures of disinfection and those of quarantine; so much so that the sanitary administration might, without inconvenience, diminish the duration of the quarantine by reason of the guarantees given by the rigor of the disinfection. The conference approved of this, but it is only the French government that has as yet put the idea in practice. The French sanitary administration, in fact, has resolutely entered upon this course, and is trying to bring in the ship companies. Steam stoves are now in operation upon several ships, and the services that they have rendered here permitted the vessels to pass quarantine upon their arrival. The congress at Havre, like the French sanitary administration, has, moreover, declared itself favorable solely to disinfection by steam under pressure, to the exclusion of all other applications of air or steam, and this, too, after numerous researches of hygienists, engineers, and physiologists

All the French lazarettos are now provided with stoves of this kind. In ports where there are no lazarettos, when a suspected or infected ship comes in, the maritime sanitary administration is obliged to send it to the nearest lazaretto. In order to remedy this difficulty, which costs much time and money, it was thought that in most cases it would prove advantageous to have a means of doing the disinfecting alongside the vessel. So Messrs. Geneste & Herscher were charged by the directing committee of the hygienic service with the construction of a disinfection boat, designed to be moored alongside of a ship, the latter being anchored in the middle of a dock where the health officer has decided to have the disinfecting done. This boat (see figure) is now stationed in the port of Havre, where it was one of the objects of attraction at the International Maritime Exhibition. The dimensions of a boat of this kind vary between 65 and 90 feet in length and 20 and 25 in width.



NEW DISINFECTING BOAT CONSTRUCTED BY THE COMMITTEE ON HYGIENIC SERVICE, FRANCE.

The boat is divided into three compartments by two iron plate partitions. The first of these constitutes the crew's quarters. It is reached through a sliding hood and a wooden ladder, and is lighted by two ports. The second compartment, which extends for half the length of the boat, constitutes the store room, and contains in the rear end a fresh water reservoir of 800 gallons capacity. The third compartment constitutes the coal bunker, and is reached by means of an iron ladder. The hull of the barge is entirely of iron, and is protected with a girdle of wood. There is a cabin on the deck for the reception of the disinfecting apparatus. This cabin is provided with six windows and two sliding doors, and contains a steam disinfecting stove of the hospital or lazaretto type. Near the stove, and in one corner of the cabin, there is an upright boiler for furnishing steam under pressure to the stove. There is, likewise, a galvanized iron tank, which is provided with an injector for supplying water to the boiler and to a power pump, whose suction pipe enters the reservoir. The cabin is divided into two compartments by an iron plate partition, so placed that the doors of the stove are on each side of it. The boiler and stove compartment also contain an apparatus for the disinfection, by chemicals, of leather, skin, or [illegible] objects that will not withstand the high temperature of the steam stove. This apparatus consists of a rectangular chamber, situated in one of the corners, and provided with two doors, one of which opens in one compartment and the other in the second. The sides of this chamber are covered with a protecting coating. The doors are hermetically closed by means of strips of silicated cloth, which the valves compress when they are closed. In the interior are supports, from which the objects to be disinfected are suspended.—*La Nature.*

Solidification of Petroleum.

The problem of solidifying petroleum has been taken up in Russia by Dr. Kauffmann, who, it is said, has obtained the best results by heating the oil with 1 to 3 per cent of its weight of common soap for about half an hour. At the end of this time the soap is entirely dissolved, and the whole mass is at once converted into a solid material, of the consistence of tallow. Cut into pieces in the shape of bricks, the petroleum thus solidified ignites only with difficulty; but, once lighted, it burns slowly, without smoke, leaving about 2 per cent of black, odorless residue. Compared to that of coal, its combustion would be one-third as rapid, and the quantity of heat produced would be far superior, when the draught is well regulated. In this state petroleum can be used in ordinary grates, or at least but slight changes would be required.

This method, which succeeds with the petroleum of the Caucasus, is, perhaps, that which has been applied in the United States, and if the success was not the same in both cases, it seems entirely owing to the difference in the composition of the two kinds of petroleum. However this may be, the question is an important one at the present day, and it is better to modify the nature of the valuable combustible than to attack the problem by devising special apparatus for its utilization.—*Revue Scientifique.*

Treatment of Consumption by Hydrofluoric Acid.

M. Garcin, availing himself of the observations already made at the glass works of Baccarat by M. Michaux, and at the Saint Louis works by M. Seiler, on the good influence of hydrofluoric acid in pulmonary tuberculosis, has instituted a series of experiments to determine the influence of this therapeutic agent. The process employed by the author consists in inclosing for an hour every day the patients in a chamber of six cubic meters (211·8 cubic feet) capacity filled with air charged with hydrofluoric acid gas. This charging is effected by passing a current of air, by the use of a pump, into a gutta percha bottle containing 300 grammes (⅔ pint) of distilled water and 100 grammes (⅓ pint) of hydrofluoric acid. The quantity of acid should vary with the patients. Those who are but slightly attacked will easily stand 20 liters (17·6 quarts) per cubic meter, while those seriously affected can only sustain 10 liters (8·8 quarts) after it has passed through a second washing flask. After fifteen minutes it is well to renew the gas, as it rapidly disappears. Under the influence of this treatment, says M. Garcin, the attacks of coughing diminish in frequency, the expectoration changes in character and diminishes, the appetite improves, and night sweats disappear. As to the *bacilli*, they are found to decrease every day, and eventually disappear from the secretions.—*Revue Scientifique.*

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BIRDS IN THE ZOOLOGICAL GARDEN AT BERLIN.

When in the late autumn the red and yellow leaves fall and the first night frosts come, there is a peculiar restlessness among the feathered inhabitants of the Zoological Garden. The migratory birds are very much excited by the call of passing birds of their species, and forget that their ability to fly has been taken from them by the injury which their wings have sustained. So they try to rise, only to fall headlong on the grass or in the water. The first cranes gather in groups and answer with deafening cries the call of the wild cranes which form themselves into regular triangles or parallel lines high in the air as they pass southward. The birds with stilt-like legs, from hot countries, such as the flamingoes and many species of storks and cranes, evidently suffer when the temperature sinks at the beginning of winter. With bristling feathers and shivering legs, they stand close together in groups or run up and down flapping their wings, trying to warm themselves. Remarkable groups can often be seen, whose conduct shows plainly that temperature causes them discomfort.

Our cut shows such a group. Here we see a whole deputation of the long-legged fellows who seem to have sought the old philosopher, the marabou, for advice and help in their trying position. He, however, seems not to be in the mood for giving counsel, and apparently feels like venting his anger in some such words as these: "I cannot help you. You must stay here. Go to your stalls, and do not bother me."—*Illustrirte Zeitung.*

BIRDS IN THE ZOOLOGICAL GARDEN AT BERLIN.

How a Blind Man Sees.

Many instances have been related showing that defection in any one or more of the human senses often results in developing the corresponding inner sense. This has been more frequently observed in persons afflicted with loss of sight and hearing. One of the kind is interestingly described in a late issue of the Chicago *Herald*, which can be safely taken as one of the most remarkable on record.

Mr. Henry Hendrickson, born in Norway forty-three years ago, but who has lived in this country forty years, was deprived of sight when six months old. He was educated at the institution for the blind in Janesville, Wis., and is the author of a book entitled "Out of the Darkness," somewhat in explanation of the mediumship with which he is becoming endowed, although unable to account for it in any manner satisfactory to himself or conformable to the known laws of physical science.

The narrative states that he is well educated, a brilliant conversationalist, and, with glasses which hide his completely closed eyes, one would scarcely recognize him as a blind man. For the last twenty years he has seldom used an escort, except when in great haste, and when going on territory entirely strange to him. Many people who have observed the facility with which he moves from place to place doubt that he is totally blind, but he has been put under the severest tests, and those who have made the investigations are convinced that he cannot see.

Describing his habits to the reporter, he said: "When in a train at full speed, I can distinguish and count the telegraph poles easily, and often do it as a pastime, or to determine our speed. Of course I do not see them, but I perceive them. It is perception. Of course my perceptive qualities are not in the least impaired on account of my blindness. I am not able to explain it, but I am never in total darkness. It is the same at midnight as at midday. There is always a bright glow of light surrounding me."

A practical test was made. A thick, heavy cloth was thrown over his head as he sat in his chair. This hung down on all sides to his waist. It was impossible for any one to see through it. Then before him or behind him, it mattered not, an ordinary walking cane was held up in various positions, and in answer to the inquiry, "In what position am I holding it?" he gave prompt and correct answers, without a single mistake, sometimes describing acute or oblique angles.

"I have never," he said, "by the ordinary sense of sight seen an object in my life, not the faintest glimmer of one. My sight or discernment does not come in that way. This will prove the idea to you: Take me into a strange room, one that I have never been into, and never heard about, and no matter how dark it is, I can tell you the dimensions of the room very closely. I do not feel the walls; I will touch nothing; but there is communicated to me by some strange law of perception the size and configuration of the room."

He then related that being in New York in 1871, he walked from Union Square to a friend's house on Forty-first Street, a long distance, with several turns, and did not make a miss. He said: "I knew the house when I came to it. I did not see it, and yet I did. I am studying shorthand, and as my hearing is very good, I expect to become an expert. I had a little trouble with my writing at first, but am now able to write very well."

Another remarkable illustration of his power to see without eyes is this: If one make motions in the air like beating the time for a choir, but describing phonetic characters, he tells the characters, and interprets them. What might be termed a "crucial test" of this was given the *Herald* reporter.

Mr. Hendrickson further said: "I'm a very good skater, and can, when gliding over the ice swiftly, see every particle on the ice, every crack and rough spot, no matter how small and indistinct. The faster I go, the plainer I can see. Well, I don't mean that I can see, but I perceive, or something. It is light to me, and I discern everything."

The Locomotive Cab.

Mr. W. W. Boyington, in an interesting article in the *N. W. Architect* on the "Architecture of the Present Time as compared with that of Fifty Years Ago," gives the following incidental reminiscence:

"We must not forget the very crude construction of railroads. First the wood stringer with iron strap rails, more familiarly known as the 'snake head' rail. On these rails the engines were constructed to run without tenders or covers of any kind to protect the engineer or fireman. They used to stand on the open platform, exposed to the severity of the weather and storms. It was in the year 1830, I think, that I was called upon by the master mechanic and general superintendent of the Boston & Albany Railroad to see if I could not devise some kind of protection at least to partially cover the engineer and fireman, and have it sufficiently open not to obstruct their view. I examined an engine and reported that I could construct a cover. I was at once employed to make the necessary drawings and superintend the construction of the first cab over an engine in this or in any other country. The result was a perfect success, upon which there has not been any material improvement, as it was almost identical with the cab now in use. I need hardly inform you that its use was immediately adopted throughout this country. Had I had forethought enough to have secured a patent for the device, I probably would not have been called upon to prepare this paper. I trust you will forgive me for diverging so far from the subject given me. The mention of these somewhat kindred subjects has been prompted by the incidents in my early life that were fastened so strongly in my mind in connection with my studies and practice in architecture."

Meteorites.

Probably the largest private collection of meteorites is that of Mr. George F. Kunz, the well known mineralogist of this city. The collection contains over one hundred specimens, one-third of which are unbroken.

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What is Hydroquinone?

The above question having been put to us by a number of our friends, we thought it would not be uninteresting to give our readers a brief review of the chemistry of this new developing agent and some statement of its general properties.

A few words may not be out of place here in explanation of the method of spelling the word as given above. Some writers in English use the term "hydrokinone;" but in looking into the matter we find this is simply an adoption of the German word without much change; whereas the correct English word used by the best scientific authorities is "hydroquinone." The reason for the latter method of spelling appears to us to be a good one. It is because the body under discussion was formerly obtained from quinic acid, one of the substances associated with quinine in Peruvian bark. We therefore prefer the word hydroquinone rather than hydrokinone, and for like reasons we reject the word hydrochinone, also used by some authorities.

Hydroquinone belongs to a class of organic bodies that the chemist calls diphenols, and hence it is sometimes called quinol; but the former name is that more commonly used. It was first obtained by Caventou and Pelletier, about the year 1820, as a product of the dry distillation of quinic acid, a compound found in Peruvian bark and a by-product in the manufacture of the well known alkaloid quinine. The above chemists did not make a thorough examination of the body, and called it pyroquinic acid, because they obtained it by heating quinic acid. Some time afterward Wohler found that he could obtain the same body by combining hydrogen and quinone (a product of the oxidation of quinic acid with manganese dioxide and sulphuric acid), and gave it the name it now bears, hydroquinone. He further found that hydroquinone could be best prepared by passing sulphurous acid gas through a warm saturated solution of quinone which has some of the undissolved substance suspended in it.

It is very interesting to note how the researches which had for their object the artificial production of the alkaloid quinine have also given us a long list of new chemical compounds that are gradually becoming useful to man as their properties are studied. Hydroquinone is one of these bodies, and although we cannot make quinine from it, yet there appears to be a great field for it in its applications to photography.

After hydroquinone as a product of the dry distillation of quinic acid had been studied, it was found to be obtainable from other sources. The leaves of the bearberry (*Arbutus uva ursi*) contain it combined with glucose, also the leaves of wintergreen (*Pyrola umbellata*). From both these sources it can be obtained by boiling the aqueous extract with dilute acids. But further study showed it to be related to benzol, the product of coal tar, and a process was soon devised to manufacture it from aniline, which is a derivative of benzol and the source of so many interesting organic compounds. The method of procedure is as follows:

One part of aniline is dissolved in eight parts of sulphuric acid and thirty parts of water, and to the cooled solution two and a half parts of potassium bichromate dissolved in water are gradually added. To the brown fluid thus obtained potassium sulphite is added, and the whole mixture is finally shaken with ether. The ether is allowed to rise and the fluid below is drawn off and rejected. By distilling the ether solution a residue is obtained which is dissolved in the smallest quantity of hot water. Sulphurous acid and animal charcoal are then added, and the solution is boiled and filtered. On standing, the hydroquinone separates out in hexagonal rhombohedral prisms.

The substance thus obtained sublimes in monoclinic plates, which, on solution in water, again gives the crystals mentioned above. It has a slightly sweet taste, and melts at 169° Celsius. It is readily soluble in hot water, alcohol, and ether (at 60° F. one part takes seventeen parts of water for solution). It reduces silver nitrate solution, and also alkaline solution of copper sulphate. It forms a compound with sulphurous acid gas, which may account for the fact that it works better in a developer which contains sodium sulphite. It may possibly be still further improved by adding sulphurous acid to this solution of sulphite and hydroquinone. The result of its oxidation is quinone, the product mentioned above, which is also obtainable from aniline by oxidation.

We have given our readers a brief review of the principal chemical properties of this exceedingly interesting developing agent. It is not as energetic as pyrogallol in its reducing power, but the results obtained are softer and the negatives are less liable to be stained. Furthermore, the fact that the reducing action of the developer is less energetic allows of its better preservation, and the same solution can be used for the production of a great many more negatives than a similar solution with pyrogallol as the active agent. At present the price of hydroquinone is considerably higher than pyrogallol, but should there be a demand for this new agent, it will be manufactured cheaply, and the reduction in price will be similar to that which took place when pyrogallol became a popular developer.

We recommend all our readers to try this new developing agent, and even at the present prices the advantages and comfort obtained in its use fully compensate for the extra expense incurred in using it.—*Anthony's Bulletin.*

Leather, Board.

According to the *Shoe and Leather Reporter*, the name leather board is something of a misnomer. In the best grades of it no leather is used at all. Essentially, leather board is a paper. It is manufactured by paper processes and on paper machinery. The raw materials are beaten up in a pulp engine, run off on what is known as a wet machine, and pressed between rollers. Then it is dried out of doors in summer, under cover in winter, after which it is calendered until finished. It is marketed in sheets. These are put up in bundles of fifty pounds each. The varying thickness of these sheets is expressed by the number of sheets in a bundle. Leather board so thick that five sheets make a 50 pound bundle is No. 5 board; that so thin that 45 sheets make a 50 pound bundle is No. 45 board. These two numbers are the extremes.

Of leather board there is a wide range of qualities. The poorest sells at about 3 cents, the best at 12 cents per pound. All grades of it are used more or less in most medium and low priced shoes. It is a shoddy, and yet in some of its uses, such as in "filling," where otherwise only small scraps of leather would be worked in, it answers the purpose even better than the latter.

Leather board may be divided, according to its uses, into three kinds: 1. That used for inner soling, shanking, filling, and the like. Materials used in the manufacture of this grade vary more than those in any other. They are all cheap, but must be supplied with a good deal of fiber, for it is a requisite that the product be both tough and solid. Thousands of pairs of shanks are made of this every year. Then, too, steel shanks are covered with it. Backed with cotton duck, inner soles are made of it. Manufacturers use it for filling between the outer and inner sole, not to cheapen, but to save the time of gathering and arranging leather scraps. Board of this quality sells at about 3 cents per pound.

2. For tapping and veneering. This is in truth shoddy. It is made to imitate leather in appearance, and to cut as near like leather as possible. When cut it must present a surface that finishes like leather, and the toughness of the product is in some measure sacrificed to secure these appearances. Scraps of leather are used in its manufacture, but these also are worked in pulp form. Veneered with a thin split of leather, just enough to satisfy the demands of the buffing machine, many outsoles are made of this board, while it is freely used for taps and heel lifts. It sells at 3¼ to 4 cents per pound.

3. Counter board. Leather board and union heel stiffenings are or ought to be made of the best board, and this is manufactured of what is known as hard stock manila, jute, and the like. When up to the highest standard, this product is rich with tough, fibrous material, will stand a great deal of wrinkling before it breaks, and may be made approximately waterproof. Boot and shoe heel stiffenings or counters of all kinds, and box toes, are made of this. When properly treated and manufactured of good stock, the counters are serviceable. When leather board is backed with a leather split and moulded into a stiffening, the product is a union counter. On this kind of board prices range from 5 to 12 cents per pound. One company, which manufactures leather board, makes a chair seat cut from this material.

The American Physique.

Last spring I received a letter from an English gentleman who is interested in anthropology and biology, asking me if there were any facts to sustain the impression abroad that the white man is deteriorating in size, weight, and condition in the United States. I had no positive information of my own to give, and I could only refer my correspondent to the data of the measurement of soldiers and to some other investigations of less importance. It occurred to me, however, that since by far the greater part of the men of this country are clad in ready-made clothing, the experience of the clothiers might be valuable, and that from their figures of the average sizes of the garments prepared by them for men's use very clear deductions could be made as to the average size of the American man. I therefore sent a letter to two clothiers in Boston who have been long in the business, one in Chicago, one in New York, one in Baltimore, one in Detroit, one in Texas, and one in Montreal. The information received in return is to this effect:

In any given thousand garments, the average of all the returns is as follows: Chest measure, 38 inches; waist, 33½ inches; length of leg inside, 32½ inches; average height, ranging from 5 feet 8½ to 5 feet 9 in New England up to 5 feet 10 for the average at the South and West. A few deductions of weight are given, from which one can infer that the average man weighs between 155 and 160 pounds. These measures cover the average of the assorted sizes of garments which are made up by the thousand. There are a few small men who buy "youths' sizes," so called, and a few larger men who buy "extra sizes."

The remarks made in some of these letters are interesting. My correspondent in Chicago states that "so far as relates to the assertion that the race in this country deteriorates, our experience teaches us that the contrary is the case. We are now, and have for several years past been, obliged to adopt a larger scale of sizes and many more extra sizes in width, as well as length, than were required ten years ago. I find that occupation and residence have a great deal to do with the difference in sizes, the average of sizes required for the cities and larger towns being much less than that required for the country. Again, different sections vary very much in those requirements. For instance, an experienced stock clerk will pick out for South and Southwestern trade coats and vests, breast measure 35 to 40, pants always one or two sizes smaller around the belly than the length of the leg inside; for Western and Northern trade, coats and vests, breast measure 37 to 42, pants 33 to 40 around the belly, 30 to 34 length of leg inside."

My correspondent in Texas gives the average 38 inches chest, 33 to 34 inches waist, 32½ leg measure, 5 feet 10 inches height, adding: "We find that the waist measure has increased from an average of 32 to 33 inches during the past five years, and we think our people are becoming stouter built."

My correspondent in Baltimore had previously made the same statement, to wit: "Since the late war we have noticed that the average sized suit for our Southern trade has increased fully one inch around the chest and waist, while there has been no apparent change in the length of pants." I asked this firm if the change could be due to the fact that the colored people had become buyers of ready-made clothing, but have for reply that the fact that the negroes are buying more ready-made clothing now than previous to the war accounts in only a small degree for the increase of the size, but is due almost entirely to the increased physical activity on the part of the whites. The experience of this firm covers thirty-five years.

My correspondent in New York states that "for the last thirty years our clothing, numbering at least 750,000 garments yearly, has been exclusively sold in the Southern States. We find the average man to measure 37 inches around the chest, 32 to 33 around the waist, 33 to 34 inches length of legs inside, average height 5 feet 10 inches. The Southerner measures more in the leg than around the waist—a peculiarity in direct contrast to the Western man, who measures more around the waist than in the leg."

My correspondent in Canada gives the following details; experience covers twenty years, about 300,000 garments a year:

Breast measure	36	37	38	39	40	41	42	44
Waist measure	32	33	34	35	36	37½	39	42
Cut per 1,000 of above sizes	80	160	240	240	140	60	60	20
Average weight for each size	140	150	160	168	175	180	200	225

"The information about the weight I got from a custom tailor of some years' experience, and cannot, of course, vouch for its correctness."

My correspondent in Detroit says: "We notice marked peculiarities in regions where dwell people of one nationality. The Germans need large waists and short legs; the French, small waists and legs; the Yankees, small waists and long legs; the Jews, medium waists and short legs. We have found a decided demand for larger sizes than we formerly used."

This subject is foreign to my customary work. I give these statements as a matter of general interest, and perhaps some of the students who are engaged in this branch of investigation may take a hint from this method and extend it still further. Possibly the average size for a woman could be deduced from the data of the manufacturers of knit goods. From what I know of the business of the clothiers to whom I made application, I should infer that the figures which I have submitted above would cover more than one hundred million garments; and I know of no better method of coming at a rough-and-ready conclusion regarding the size of men than the one which I have adopted. The subject has interested me from the standpoint of better nutrition. It will be observed that the American man is decidedly gaining in size and weight. Cannot some one obtain data for comparison with these sizes from the statistics of military recruits and conscripts in Europe or from the contractors for army clothing?—*Edward Atkinson, in Science.*

Liquid Cement or Gum.

To make one gallon of the gum, about one and a half gallons of water, 3 pounds of glue, 4 ounces of borax, and 2 ounces of carbonate of soda, or an equivalent of any other alkali, are taken. The glue and alkaline salts are dissolved in the water by heat, and the solution is kept at a temperature a few degrees below boiling point for 5 or 6 hours. The continued application of heat renders the gum permanently liquid at the ordinary temperature. After allowing the sediment to settle, the clear liquid is evaporated to the required consistency.

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JOSIAH PARSONS COOKE.

BY M. B.

Allusion has been made in earlier sketches of this series of distinguished American scientists to the remarkable influence exerted by the elder Silliman on those who were fortunate enough to come under his instruction. Of this class may be mentioned Josiah Parsons Cooke, the subject of this sketch. He was born in Boston, Mass., on October 12, 1827. His father was a distinguished lawyer, and for some years the oldest member of the Suffolk County Bar. Of his early fondness for science, the story has been best told in his own words. In 1859, before the Lowell Institute, in Boston, he said: "With one exception, the only course of lectures on chemistry before this Institute, previous to the one just concluded, were delivered by Professor Silliman, of New Haven, in the years 1839-43. At those lectures I was an attentive listener. Although a mere boy—one of the youngest of those present—I then acquired my taste for the science which has since become the business of my life. Returning, after so short an interval, to occupy the place of him who was thus unconsciously my instructor—I might add, my only instructor in chemistry—I know of no way in which I can pay a higher tribute to his worth, or to the usefulness of this noble charity, of which he was only the almoner, than by a simple statement of these facts."*

Prof. Cooke's father fitted up for him in the wood shed a small laboratory, and there he passed his holidays in making experiments.

Three great chemical inventions, that greatly interested him, occurred during these years, and he himself, referring to the first of these, says: "I remember distinctly the old tinder box, and a card of the first friction matches was one of my earliest toys." Soon after the first daguerreotypes, brought from Paris, were exhibited on Tremont Row, in Boston, and these, too, greatly excited his interest. Amateur photography was not so decided a craze then as it is now. Nevertheless, he soon acquired a knowledge of this new chemical art, and some of the earliest talbottypes taken in the United States were made by him, and he still retains the negatives of buildings on State Street long since replaced by others. In 1845, Schonbein announced his discovery of gun cotton, and when the news of this event reached Boston, young Cooke began his experiments with modern explosives.

He then entered Harvard College, from where he was graduated with high rank in 1848. At that time no practical instruction in science was given to the undergraduates, and chemistry was dismissed with a few lectures. He received no systematic instruction in this science, but having, as has been shown, acquired a fondness for it, continued its study at home.

The year following his graduation he spent in travel in Europe, and while there was appointed tutor of mathematics in Harvard. He entered on the duties of this place in August, 1849, and during the second term of this academic year he was asked to give a course of experimental lectures on chemistry to one of the college classes. There was no laboratory at that time in Cambridge, and no chemical apparatus; so that all of the illustrations given in these lectures were made with the material that he collected in the little laboratory at home.

At the close of the course, he was appointed instructor in chemistry, and in December, 1850, at the age of twenty-three, he became the Erving Professor of Chemistry and Mineralogy in Harvard College, a chair that he has since continued to hold. Although self-taught in that science which has since become his profession, still he has done more than almost any other one man to give to chemistry its proper status in the collegiate curriculum as a valuable disciplinary study entitled to a leading place in an effective system of liberal education.

After being appointed to this chair, he was given permission to spend six months in Europe for the purpose of study. This time he devoted chiefly to visiting chemical laboratories, in making himself familiar with the methods of instruction and in collecting apparatus.

In the autumn of 1851, a lecture room was assigned to him in the north end of University Hall, and in the cellar beneath he fitted up a laboratory, in which the first practical instruction, in chemistry was given to undergraduate students in an American college.

Only a limited election of studies was permitted at that time in Harvard, and students were only allowed to choose qualitative analysis as an extra course to their regular work. Still, a number of young men availed themselves of the privilege, among whom were Charles W. Eliot, now president of Harvard University, Alexander Agassiz, Theodore Lyman, and Frank H. Storer, professor of agricultural chemistry at the Bussey Institute; but, as the interest developed, the college authorities, recognizing the value of the study of practical chemistry, soon permitted the undergraduates to elect that subject for one year in place of French.

From these small beginnings the department has steadily grown, until it now offers the undergraduates as broad and thorough instruction in the various departments of chemistry, including mineralogy, as any similar institution in the country.

In 1857, the present laboratory in Boylston Hall was built with funds partly bequeathed by Nicholas Boylston and partly raised through the individual efforts of Professor Cooke among friends of the university in Boston.

The laboratory was enlarged in 1870, and at present, in 1887, there are over three hundred students working at its tables. Thirteen distinct courses of instruction are given, including every branch of chemical science, and three professors, one instructor, and three assistants are employed in teaching.

Although teaching has been the principal duty of Professor Cooke's life, still he has found time to devote himself continuously to original investigation. His best work has been in the direction of pure chemistry. Among the earliest of his papers was one "On the Relation between the Atomic Weights of the Chemical Elements," * in which it was first shown that when the elementary substances are classified in natural groups, their atomic weights and other physical qualities are related by regular differences, thus indicating the classification since more elaborately worked out by John A. R. Newland and D. Mendelejeff. This memoir received the highest encomiums of Sir John Herschel in his remarks on chemical science at the Leeds meeting of the British Association for the Advancement of Science in 1858.

Josiah P. Cooke

NATIONAL ACADEMY OF SCIENCES.

Among other important papers published by him may be mentioned "On Two New Crystalline Compounds of Zinc and Antimony, and on the Cause of the Variation of Composition in these Crystals;" "Crystalline Form not Necessarily an Indication of Definite Chemical Composition;" "Danalite (named after James D. Dana), a New Mineral Species from the Granite of Rockport, Mass.;" "Cryophyllite, a New Mineral Species of the Mica Family;" "The Vermiculites."

In 1877 he published an investigation on the atomic weight of antimony, which is one of the most exquisite and perfect pieces of chemical research ever executed. It received the commendation of chemists, both in the United States and Europe, and its results have been definitively accepted as correct, necessitating the rejection of earlier determinations made by Dexter, Dumas, and Kessler.

More recently he has been engaged on an investigation of the relation of the atomic weights of hydrogen and oxygen, the results of which will soon be published.

He has made many and important contributions to the forms of apparatus used in chemical and physical demonstration and research, with the cunning hand of a skillful experimentalist and manipulator.

He has shown great activity in the movement tending toward the substitution of scientific studies for Greek in the college curriculum. His influence has made itself felt by his able essays on this subject, and most practically by his pamphlet entitled "The Fundamental Principles of Chemistry" (Cambridge, 1884), in which he sets forth a new system of instruction in elementary chemistry.

The teaching of elementary chemistry, even when connected with laboratory instruction, has been hitherto chiefly limited to a mass of details in regard to the properties and the chemical elements with their compounds. In this new system he has confined the elementary instruction to the general laws and principles of the science, thus making the subject a more serious study and a better training in the principles of the inductive philosophy than it ever was before.

This manual, thus briefly described, was prepared in order to indicate the nature of the requisition in chemistry which may be offered to candidates for admission to the college, together with a certain amount of mathematics and physics in place of Greek.

In 1882 Professor Cooke received the degree of LL.D. from the University of Cambridge, England. He is a member of the leading scientific societies in the United States, and in 1872 was elected to the National Academy of Sciences. In 1876 he was elected an honorary fellow of the London Chemical Society, a distinction which in the United States is held by but one other chemist. He was elected Corresponding Secretary of the American Academy of Arts and Sciences in 1873, and since that time has edited fourteen volumes of their "Proceedings" and one volume of "Memoirs." He has likewise long been an associate editor of the *American Journal of Science*.

Professor Cooke's publications in book form include "Chemical Problems and Reactions" (Cambridge, 1857); "Elements of Chemical Physics" (Boston, 1860), which, to quote Professor Silliman, "is an elaborate treatise in advance of anything before attempted in this country, or, in fact, in our language;" "First Principles of Chemical Philosophy" (1868, revised edition 1882); and the "New Chemistry" (New York, 1872; revised edition, 1884). The latter, originally delivered as a series of lectures before the Lowell Institute and subsequently published in the "International Scientific Series," was the earliest consistent exposition of a uniform system of molecular mechanics, and its philosophy has been widely accepted, both in England and in Germany; and has been translated into most of the languages of Europe. His contributions to chemical science have been collected in a single volume entitled "Chemical and Physical Researches" (Boston, 1881). The course of lectures delivered on Sunday evenings in Brooklyn, in which he aimed to show that the argument for design is not invalidated by the theories of evolution, was published as "Religion and Chemistry; or, Proof of God's Plan in the Atmosphere and its Elements" (New York, 1864, revised edition 1880); and several of his graceful addresses have been collected as "Scientific Culture and Other Essays" (New York, 1881; with new edition 1885)

* Fisher's "Life of Benjamin Silliman," vol. ii., p. 325.

* "Memoirs of the American Academy," 1854.

Ink Formulæ.

The following formulæ are taken from Dieterich's Manual:

Red Copying Ink.—Dissolve 50 parts of extract of logwood in a mortar in 750 parts of distilled water without the aid of heat; add 2 parts of chromate of potassium and set aside. After twenty-four hours add a solution of 3 parts of oxalic acid, 20 parts of oxalate of ammonium, and 40 parts of sulphate of aluminum in 200 parts of distilled water, and again set aside for twenty-four hours. Now raise it once to boiling in a bright copper kettle, add 50 parts of vinegar, and, after cooling, fill into bottles and cork. After a fortnight decant. This ink is red in thin layers, writes red, gives excellent copies in brownish color, and turns blackish brown upon the paper.

Violet Copying Ink.—Dissolve 40 parts of extract of logwood, 5 of oxalic acid, and 30 parts of sulphate of aluminum, without heat, in 800 parts of distilled water and 10 parts of glycerine; let stand twenty-four hours; then add a solution of 5 parts of bichromate of potassium in 100 parts of distilled water, and again set aside for twenty-four hours. Now raise the mixture once to boiling in a bright copper boiler, mix with it, while hot, 50 parts of wood vinegar, and, when cold, put into bottles. After a fortnight decant it from the sediment. In thin layers, this ink is reddish violet; it writes dark violet, and furnishes bluish violet copies.

THE deepest well in this country is at Northampton, Mass., sunk by Belding Bros. & Co., silk manufacturers. It is 3,700 feet deep and 8 inches diameter. At a depth of 150 feet from the surface a sedimentary sandstone was struck, which continued the whole depth, and water was never obtained. At St. Louis there is a well 3,180 feet deep, which yields an abundance of sulphur water.

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ENGINEERING INVENTION.

A steam generator has been patented by Mr. Alfred Musil, of Steyr, Austria-Hungary. It is a rotatory generator, in which the water is subjected to the action of the heat in comparatively thin layers within receptacles presenting extended heating surfaces, there being but few joints requiring to be made steam tight, and the configuration of the parts being such that they will best resist strain.

AGRICULTURAL INVENTION.

A fender has been patented by Messrs. Walter McCoy and James McArthur, of Miltonvale, Kansas. It is an improved fender for corn, comprising a draught bar and a shield loosely connected therewith, a chain or similar support sustaining the weight of the draught bar and relieving the shield of the pressure, efficiently protecting the plants over which the shield or fender passes.

MISCELLANEOUS INVENTIONS.

A staple driver has been patented by Mr. Willis W. Bloodworth, of Molino, Fla. The invention covers a novel construction and arrangement of parts in a device for driving staples when building wire fences, the wire being held in position while the staples are driven over it.

A grinding and polishing material has been patented by Mr. Charles M. Lindsey, of Pittsburg, Pa. This invention covers a process of making such material of pulverized steel, the steel being first heated to a high temperature, then immersed in a bath of water, salt, and soda, and the crystals subsequently pulverized.

A toggle fastening for buttons, etc., has been patented by Mr. Charles V. Richards, of Skowhegan, Me. It is a needle-pointed toggle, so made as to not only form a slotted and crooked fastening, but also to puncture and make its own passage through the garment or fabric when attaching the button or article to its place.

A process of making pyrosulphates has been patented by Mr. Heinrich Baum, of Mannheim, Germany. It consists in heating the acid sulphates of the alkali metals, as also of ammonia, in a vacuum, to temperatures below brown heat, or between 200° and 400° C., it being feasible to perform the operation in cast iron vessels.

A bow resining attachment for violins has been patented by Messrs. Edwin M. and Ernest S. Comstock, of Cascade Valley, N. Y. It consists in a resin dust box supported near the strings of the violin, so that its vibrations when in use will cause the resin to fly on to the strings and bow, and make the usual resining by hand unnecessary.

A bobbin catch for spinning machines has been patented by Mr. Isaac L. Allen, of Brooklyn, N. Y. It is a thimble-like catch inserted within or through the head of the bobbin, and having an interior flange on its outer end, reducing the cutting and wear of the button and its catch, while the catch or thimble may be turned in its seat to change the weaving surfaces.

A carpet stretcher has been patented by Mr. Andrew McFarland, of Thomaston, Me. Combined with a lever and brace having a longitudinal slot, with a guide bar mounted to ride in the slot, is a spring-actuated clamp with an eye embracing the guide bar, a shoe and slip ring, with other novel features, whereby great power, efficiency, and convenience in use are obtainable.

A gauge attachment for scroll sawing machines has been patented by Mr. Frank R. Schloer, of Baltimore, Md. It is adjustably supported in accordance with a novel construction above the work passage or support, and adapted for use in sawing circular and irregular forms, being calculated to save time and labor and insure greater accuracy and neatness of work.

A tapered nail has been patented by Mr. John Hyslop, Jr., of Abington, Mass. This invention covers a new article of manufacture consisting of a nail having the longer dimension of its point about parallel with the longer dimension of the upper part or head portion of the nail, so the nail can be driven easily and truly without splitting the work, and will hold well.

An oil vapor heater has been patented by Mr. William W. Batchelder, Jr., of Boston, Mass. It is of that class in which a wick draws up the oil, which is vaporized at the wick by a small initial flame and then passes as unconsumed vapor to the burner proper, the device preventing the escape of bad odors, increasing the heating capacity, and regulating the vaporization of the oil.

An elevator hatchway has been patented by Mr. Edwin Spencer, of Brooklyn, N. Y. This invention provides a series of plates or platforms beneath the car, and independent thereof, adapted to close the hatchway at each story as the car ascends, and a second series of plates carried by the car, independent of the first series, adapted to cover the hatchway at each story as the car descends.

A thill coupling has been patented by Mr. Frank L. Burton, of Erie, Pa. It has an anti-rattler and pivot-holding device of an elastic plate or plates placed between the coupling clip or axle and the thill iron eye and forcing the eye to the pivot, a flange plate connected to the elastic plates bearing against the end and side of the pivot to prevent endwise displacement and rotary motion thereof.

A thill coupling has been patented by Messrs. Henry and John Knupp, of Warren, Pa. Combined with a pivoted thill iron and anti-rattler placed next thereto are opposite plates clasping the anti-rattler, one of the plates having a lug overlying the head of the thill iron pivot, the device obviating rattling, preventing loss of the pivot, and promoting the durability of the entire coupling.

A bailer has been patented by Mr. David F. Brown, of Washington, Pa. This invention relates particularly to bailers with a body or tube the lower end of which has a valve-seated opening, a valve for closing the opening, and a dart or stem fixed to the valve and extended out of the tube or body, being especially designed for bailing the sediment out of oil and artesian wells.

A drag saw machine has been patented by Mr. Cornelius W. Wright, of Democracy, Ohio. It is a portable device having a longitudinal beam having a pin at one end to engage the log, and supported by hinged legs at the other end, an operating lever being pivotally supported in the hinged legs, and standards pivotally connected to the beam supporting the saw in working position.

A machine for making paper tubes has been patented by Mr. Thomas Granger, of New York City. Combined with a mandrel having one end unsupported and an endless belt arranged in connection therewith are fixed rollers and rollers carried by swinging arms, one pair of the arms having extensions carrying a paste-applying roller, with other novel features, the machine being of simple construction and designed to make paper tubes quickly.

A clock has been patented by Mr. Henry A. Russell, of Boyne City, Mich. The invention covers a novel attachment adapted to carry multiplying gearing, whereby clocks made to run only a short period can be readily made, at but slight expense, to run for a much longer time without winding up, as, for instance, a thirty-hour clock can be made into an eight-day clock, or longer, and the attachment can be applied to clocks run by springs or weights.

SCIENTIFIC AMERICAN
BUILDING EDITION.

DECEMBER NUMBER.

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3. The Shakespeare Memorial at Stratford-upon-Avon.
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5. Engravings of Five Tasteful Residences recently erected at Glenridge, N. J., varying in cost from Four Thousand to Six Thousand Five Hundred Dollars.
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The *Railroad Gazette*, handsomely illustrated, published weekly, at 73 Broadway, New York. Specimen copies free. Send for catalogue of railroad books.

The Knowles Steam Pump Works, 113 Federal St., Boston, and 93 Liberty St., New York, have just issued a new catalogue, in which are many new and improved forms of Pumping Machinery of the single and duplex, steam and power type. This catalogue will be mailed free of charge on application.

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The Holly Manufacturing Co., of Lockport, N. Y., will send their pamphlet, describing water works machinery, and containing reports of tests, on application.

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Curtis Pressure Regulator and Steam Trap. See p. 364.

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NEW BOOKS AND PUBLICATIONS.

TWELVE TIMES TWELVE. By Miss M. A. Lathbury. Worthington & Co. Price, $1.75.

This consists of illustrations of child life in facsimile water color prints. The drawings are accompanied with well selected verses from the best poets.

CANADA STATISTICAL ABSTRACT AND RECORD FOR THE YEAR 1886. Published by the Department of Agriculture. Ottawa. 1887. Pp. 467.

In this work, compiled by Mr. Sydney D. Ropes, a very full statement of data referring to the Dominion is given. History, constitution, finance, tariff, arts and products, and many other topics are treated. To those interested in our neighbor, the work will be of great value. The cheerful statement of her net public debt—$223,159,107 on June 30, 1886, making an increase of $26,751,415 since June 30, 1885—offers an argument that annexationists should ponder well over before desiring to take possession of so encumbered an estate. The fisheries for 1885 are put at a produce value of $17,722,973, and for 1886, $18,679,288. The full statement of fish produce is given in great detail. These figures show that Canada has a very big bone of contention for her interests to be settled by Mr. Chamberlain and his *confreres*.

NATURAL LAW IN THE BUSINESS WORLD. By Henry Wood. Boston: Lee & Shepard; New York: Charles T. Dillingham. 1887. Pp. 222. Price 30 cents.

This is a cheap reprint of what has proved a very popular book. The author deals with questions of economic science, and treats them largely from the conservative side. A special appeal for the increase in its circulation that appears on the cover makes it clear that it was designed for a special purpose—the confutation of some of the theories that have within the last few years been offered to the world. The work is acceptable, and well worthy the perusal of all interested in the maintenance of the present order of things.

A HISTORY OF PHOTOGRAPHY. By W. Jerome Harrison, F.G.S. New York: Scovil Manufacturing Company. 1887. Pp. 136.

This interesting work deals with the history of the photographic art from the earliest times. The dry plate and the many efforts at the production of a dry plate process receive much attention. The work done in color photography, and the probable outcome for the future, are fully treated by the author. Paper negatives and built-up prints from several negatives are described. The subject of orthochromatic photography and the more recent achievements in composite portraiture and in instantaneous work, involving the systematic study of the motion of animals, by Marey and others, seems to be outside of the author's scheme, and little or nothing is said of them. It is a work which every intelligent worker should possess and study. It has as frontispiece a characteristic portrait of the author reproduced by Moss type from a negative by Harold Baker, of Birmingham, England.

THE CHILDREN OF SILENCE; OR, THE STORY OF THE DEAF. By Joseph A. Seiss, D.D., LL.D. Philadelphia: Porter & Coates. 1887. Pp. 208.

This little work is a succinct account of the world of the deaf and dumb. The census of the deaf mute population of different countries discloses who are the subjects of the treatise. The causes, congenital and adventitious, of deafness are fully considered. The sad condition of those thus affected is eloquently depicted. The labors of the early instructors in this field are summarily given, from the 13th century down. Modern institutions are catalogued in tabular form; their size, method of teaching, and other particulars are given, and a synopsis of the more extended tables closes the work.

SPON'S HOUSEHOLD MANUAL. A Treasury of Domestic Receipts and Guide for Home Management. E. & F. N. Spon, London and New York. 1887. Pp. vii, 988.

The title of this work pretty well indicates its scope. The dwelling and its surroundings, water supply, sanitation, ventilation, lighting, etc., its furniture and decoration, are fully treated. Thieves and fire, the larder, cooking and preserving food, the management of the nursery, and all imaginable home topics, are all among its subjects. Home recreations and medicine, games, the playground, workroom, library, and laundry, receive attention, while in out of door operations the farmyard and garden are included. A chapter on domestic law, landlords and tenants, lodges, servants, etc., is calculated more for the English horizon than for our country. Where needed, illustrations are given, and the book may safely be recommended to all housekeepers.

Notes & Queries

HINTS TO CORRESPONDENTS.

Names and Address must accompany all letters, or no attention will be paid thereto. This is for our information, and not for publication.

References to former articles or answers should give date of paper and page or number of question.

Inquiries not answered in reasonable time should be repeated; correspondents will bear in mind that some answers require not a little research, and, though we endeavor to reply to all, either by letter or in this department, each must take his turn.

Special Written Information on matters of personal rather than general interest cannot be expected without remuneration.

Scientific American Supplements referred to may be had at the office. Price 10 cents each.

Books referred to promptly supplied on receipt of price.

Minerals sent for examination should be distinctly marked or labeled.

(1) F. T. asks: What is the best and most simple method of lining brass boxes (such as car journal bearings) with lead or a low grade of Babbitt metal, without the aid of grooves or holes in the brass, so that the lead, etc., will adhere firmly to the box? A. There is no way known to us of lining a brass journal box, except by tinning or employing the grooves and holes as suggested by you, nor do we see the value of building up a car journal box with anything but the best Babbitt, which will hold by flushing with tin.

(2) S. asks how window glass is measured in the box. A. A box of window glass contains 50 square feet of glass without regard to size.

(3) A. L. F.—Gas and electric light fixtures can only be brightened by taking apart and dipping in boiling caustic soda to remove dirt and old varnish. Wash in hot water, then dip in strong nitric acid for a few seconds, wash in boiling water, dry in

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sawdust, and burnish the parts required to be bright; after which, the surface can be lacquered with clear shellac varnish. We do not recommend this for amateur practice. It requires some experience to bring out the work clear.

(4) B. A. asks for directions for making the composition for self inking pad for rubber stamps. A. The usual composition consists of, 2 to 4 drachms aniline, of desired shade, 15 ounces alcohol and 15 ounces glycerine. The solution is poured on the cushion and rubbed in with a brush. Another formula includes 1 part gelatine, 1 part water, 6 parts glycerine, and sufficient coloring matter.

(5) W. M. asks (1) how to make a good root beer, similar to Hier's. A. Take 10 gallons water, heat to 60° Fah., then add 3 gallons molasses, let it stand two hours, pour it into a bowl and add powdered or bruised sassafras and wintergreen bark, of each 2 pounds, yeast 1 pint, bruised sarsaparilla root ½ pound, add water enough to make 25 gallons in all. Ferment for twelve hours, then bottle. 2. How to make a cherry floor stain. A. Take rain water 3 quarts, annatto 4 ounces, boil in a copper kettle till the annotto is dissolved, then put in a piece of potash, the size of a walnut, keep it on the fire for half an hour longer, then bottle for use.

(6) L. P. asks (1) how prepared gypsum for calcimining and whitening is manufactured. What is the best and cheapest way to pulverize the gypsum formaking plaster of Paris, also the best way for calcining it? A. It is ground between burr stones until it is reduced to a fine powder. This is calcined by being heated in kettles or stills, the escaping water producing a movement like ebullition. 2. How can I test lime rock to tell whether it will make hydraulic lime or not? A. By testing for silica. To be a good hydraulic cement, it must contain at least 10 per cent of silica. A. 3. What is red pipe clay good for? Will it make paint if ground fine? A. Any colored oxide mixed with linseed oil can be used used as a paint, but if it requires too much oil, then it is practically valueless. Pipe clay can be used for the cheaper grades of pottery.

(7) F. B. desires a good receipt for stopping a crack or small hole in a large sink. A. Take of litharge 20 parts and 1 of burnt lime in fine, dry powder. Make into a putty with linseed oil.

(8) W. C. V. asks a recipe for a good liquid blueing for laundry work. A. Take 1 ounce of soft Prussian blue, powder it and put in a bottle with 1 quart of clear rain water, and add ¼ ounce of oxalic acid. A teaspoonful of this is sufficient for a large washing.

(9) R. S. S. H. asks: What can be done to renovate and brighten the gilt frames of pictnres and mirrors that have become rusty and dingy? A. You may improve them by simply washing them with a small sponge moistened with spirits of wine, or oil of turpentine,the sponge only to be sufficiently wet to take off the dirt and fly marks. They should not be wiped afterward, but left to dry of themselves.

(10) H. C. D. writes: Can you give me a recipe for a laundry marking ink which will not wash or bleach out in the ordinary way of washing, and will flow freely from the pen, and will not need any preparation for setting it in either heat or chemical, but will be indelible from the minute it is put on the goods? A. Dissolve with the assistance of heat, 20 parts of brown shellac in a solution of 30 parts of borax in 300 to 400 parts of water, and filter the solution while hot. Then add to the filtrate a solution of 10 parts of aniline black soluble in water, three-tenths parts of tannin, one-tenth part of picric acid, 15 parts of spirit of sal ammoniac, and one-quarter ounce of water. To purify water see the "Purification of Drinking Water by Alum," contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. 491.

(11) H. L. H. asks if there is anything which will positively remove large moth patches or freckles from the face, without injuring the skin. A. There is probably nothing known that will positively eradicate freckles. Among the many cures recommended, the following has the merit of being harmless: Dissolve three grains of borax in 5 drachms of each, rose water and orange flower water.

(12) W. V. B. writes: I have quite a little silver dissolved in a solution of cyanide of potassium, which has been used for electroplating. How can I obtain the silver either as a nitrate or chloride, and will it be pure enough for photographic purposes? A. Precipitate with the battery and dissolve in nitric acid.

(13) F. K.—Asphaltum is the only gum we know of that will withstand the action of nitric acid.

(14) E. H. S. & Sons ask how glass is silvered. A. For this purpose a large, perfectly flat stone table is provided. Upon it is evenly spread a sheet of tin foil without a crack or flaw. This is covered uniformly to the depth of ⅛ inch with clean mercury. The plate of glass, perfectly cleansed from all grease and impurity, is floated on to the mercury carefully, so as to exclude all air bubbles. It is then pressed down by loading it with weights, in order to press out all the mercury which remains fluid, which is then received in a gutter around the stone. After about twenty-hours it is raised gently on its edge, and in a few weeks it is ready to frame.

(15) L. T. S. asks for a liquid glue containing no acid. A. Liquid glue may be made by dissolving glue in nitric ether. The following formula is stated to be very good: 1 part sugar is dissolved in warm water, ¼ part slaked lime is added, it is kept at 145°–165° Fah. for some days, with occasional shaking, and is then decanted. 1 part of glue is dissolved in 4 or 5 of above clear solution, to which 2 to 3 per cent of glycerine and a few drops of lavender oil are to be added.

(16) W. A. P. asks the cheapest, simplest, and most practical way for an amateur to make a furnace to melt from 5 to 10 pounds of brass for casting. A. You can easily melt 5 to 10 pounds of brass in a blacksmith's forge. Use a blacklead crucible of the proper size. Build a fire chamber around the tuyere 2½ times the diameter of the crucible, with fire brick, or common brick if you have no fire brick. Use no mortar. Bank around the outside with forge ashes or cinder. Set the crucible 4 or 5 inches above the tuyere on the fire and fill in all round, and cover with a large piece of charcoal. Put in the metal after the fire is started. Keep the crucible lifted to its proper place as the fire settles. Do not blow too hard, nor heat the metal so hot as to boil it, which makes it spongy. Use a little powdered charcoal on the surface of the metal while melting, to keep it from oxidizing. Blow the charcoal off with a hand bellows when ready to pour.

(17) A. M. M. has a quantity of spoiled dry plates, and asks how to save the silver in the films. A. To recover the reduced silver, first get off the gelatine film by immersing the plates in a weak solution of hydrofluoric acid and water, dropping each film, as it is easily pulled off the glass,into a deep porcelain evaporating basin. Cover the films with hot water, then add a few crystals of common washing soda sufficient to make the solution alkaline, bring it to a boil, and stir well until the gelatine in the films is dissolved. No change of color will be observed until a small quantity of sugar is added. Then the solution first turns gray, brown, and finally black; continue the boiling for 15 minutes. Rest the solution for a few minutes, then extract a little of the black sediment in the bottom and test its solubility in nitric acid. If it does not dissolve completely, continue the boiling for half an hour, adding a little more washing soda. When it is found to readily dissolve in nitric acid, then pour off the brown colored supernatant fluid, and replace with water. Stir up the sediment so it may be well washed, and allow the sediment to settle. Continue washing in this way two or three times until the supernatant water is quite clear. Then the mass of silver sediment is converted into nitrate of silver by the cautious addition of dilute nitric acid. If the same is added too rapidly, the frothing up of the mixture is liable to cause loss of silver. When the sediment is all dissolved, we have a solution of nitrate of silver, which should be evaporated to dryness over a sand or water bath. Afterward the crystals may be redissolved for use in making silver solutions. While useful, more especially for emulsions, this process may be used for films. 2. Why do ferrotype plates have a bluish color when taken out of the sensitizing silver bath? A. A bluish film is due to a bath too strong for the collodion, too cold a temperature of the bath, or because it is a new bath insufficiently iodized. A single solution for developing dry plates that will keep may be made as follows: Sulphite sodium (chem. pure) crystals 4 oz., warm distilled or melted ice water 6 oz.; when cooled to 70° add sulphurous acid water (strongest strength obtainable) 3 oz., pyrogallol 1 oz., carbonate of potash (chem. pure) 1¼ oz. The weights are avoirdupois, or 437 grains to the ounce. Place one and a half drachms of the above solution in a graduate, and fill with water up to two ounces, then pour the developer over the plate. Development should commence in less than a minute. In case the plate is underexposed, add half a drachm of the solution at a time, until the development proceeds faster. If the image flashes out quickly from overexposure, dilute the developer at once with a large quantity of water. The developer may be used on three or four plates in succession, and should then be thrown away. Keep the bottle of mixed developer well corked. The solution will work well as long as it is not thick and muddy.

(18) G. P. S. says: May we ask you to state in your paper the greatest distance which a projectile has been thrown from any gun—cannon—now manufactured? A. We believe the greatest range attained has been by means of the De Bange cannon—11 miles.

(19) J. F. M. asks if an iron or steel bushing one-eighth of an inch thick, made to drive in a brass hole, would have a tendency to get loose by heating to a cherry red heat, or could a brass bushing be used in an iron hole? A. The bushing will not remain tight after heating. The brass expands more than the iron, as 3 to 2. If the brass is inside the iron, it will be quite loose. If an iron bushing is driven in brass, it will be moderately tight after heating, because the brass expands away from the iron by heating and returns into contact by cooling.

(20) A. S. asks what material is used in laundrying cuffs and collars, to make them so glossy. A. The simplest preparation consists of the following: Pour a pint of boiling water upon 2 ounces of gum arabic, cover it, and let it stand overnight. Use a tablespoonful of this.

(21) A. M. desires (1) a receipt for a good cheap liquid stove polish. A. See answer to query 5 in SCIENTIFIC AMERICAN for November 12, 1887. 2. A preparation that will remove moss dirt and discolorations from marble. A. Mix quicklime with strong lye, so as to form a mixture having the consistency of cream. Apply it immediately with a brush and allow to remain for a day or two, and then wash off with soap and water.

(22) J. S. K. asks: 1. What is the composition of the enamel which is applied to bicycles? A. It is japan varnish. 2. A liquid to apply to a rubber coat which has been so damaged by heat that it is not waterproof? A. Coat it with a solution of rubber dissolved in carbon disulphide. See the article on this subject in SCIENTIFIC AMERICAN SUPPLEMENT, No. 251.

(23) R. M. D. asks a receipt for making a harness grease. A. Try the following: 1 quart neat's foot oil, 4 ounces beef's tallow, and 3 tablespoonfuls lampblack; add 4 ounces beeswax for use in summer weather.

(24) O. J.—See Notes and Queries, No. 4, May 28, 1887, and No. 17, March 12, 1887, about polishing agates, geological specimens, etc.

(25) J. A. G. asks how to manufacture a metallic paint from magnetic iron ore. A. The ore may be ground, dried, and mixed with linseed oil.

(26) J. B. R. wishes (1) a receipt for a cement for putting a leather facing on an iron wheel rim for a friction gear to scroll saw. A. There is nothing better for gluing leather to iron than good tough glue with a dozen drops of glycerine to the half pint. The pulley or rim should be made perfectly free from oil and dirt and the face thoroughly scratched over with a file. Then treat with nitric acid 1 part, water 1 part, for a few minutes, to deaden the surface. Wash with hot water to free the surface from acid. Scarf one end of the leather band; glue and draw tightly around the rim, lap the thick end over the scarf and clamp. Afterward trim the surface even. 2. A receipt for a cement for putting a wood veneer face on an iron saw table. A. The same kind of glue is the best for veneer on iron,but nothing will withstand the ultimate shrinking of wood on iron, it is too rigid; better make the saw table facing thick enough to put on with flat head machine screws.]

(27) D. & H. ask the process and how to make solution used to color bronze hinges, locks, etc., a rich brown, the color of confectioner's chocolate. A. For a dipping brown, use to 1 pint of water 5 drachms perchloride of iron. The articles must be made perfectly clean and dipped in the hot solution until the required color is obtained; then dipped in clean hot water, dried, and lacquered. If only a varnish is required, use clear shellac varnish colored with dragon's blood, gum, and burnt umber.

(28) G. V.—For painting tin roofs use red oxide of iron (Prince's metallic paint) mixed with boiled linseed oil. Temper the color with lampblack if a darker color is required, or with white lead for a lighter color. If necessary to facilitate spreading with the brush, add a little spirits turpentine. This paint is tough, holds well, and if neatly done looks well. Coal tar paints are sometimes used, but are liable to chip in cold weather.

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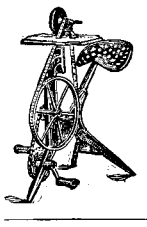

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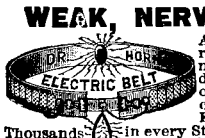

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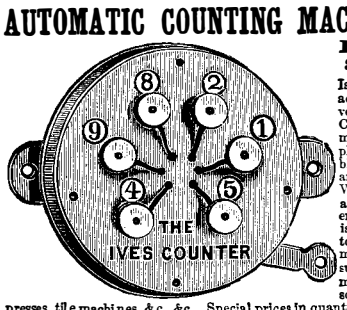

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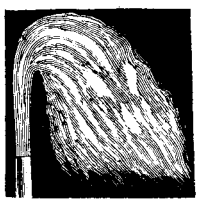

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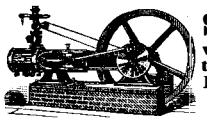

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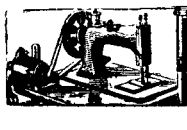

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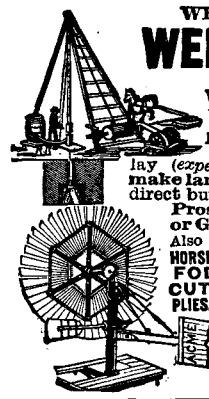

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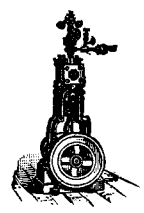

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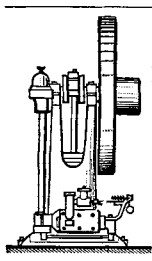

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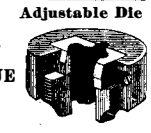

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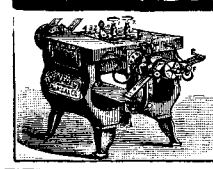

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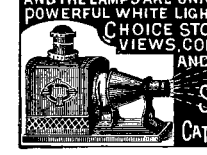

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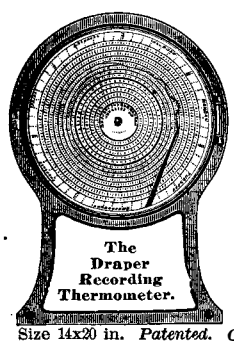

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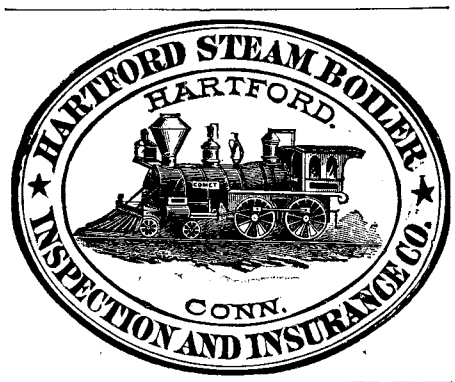

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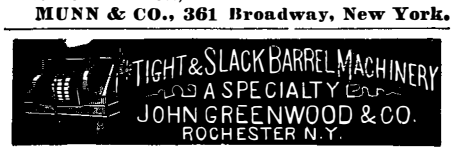

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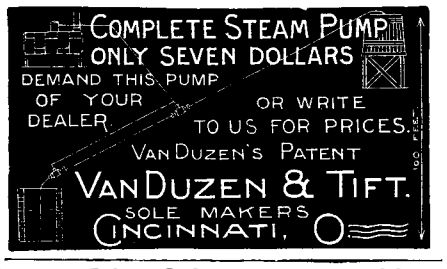

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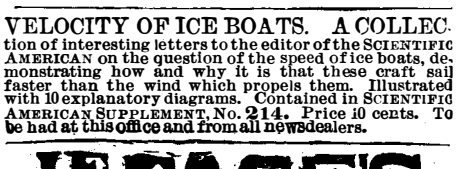

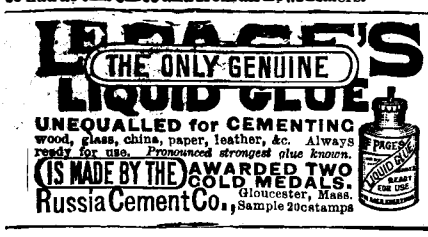
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